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Snead Electric Heat Treating and Annealing Process

A Description of a Method of Direct Electric Heat Treatment of Tubes, Rods, Strips, etc., in All Metals. Abstracted From a Lecture Before the American Society for Steel Treating

By CHARLES C. WAITE
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This resistance method of electric heat treatment was developed by Snead and Company of Jersey City, N. J. The process is not new. We have been using it in production for the past seven years and incidentally doing considerable experimental work for patent purposes, but only recently have we made any effort to introduce it commercially.

Fundamentally, the process consists of passing an electric current through the mass of the piece to be heat treated, the resulting heat being due to its own resistance to the passage of this current, the temperature being determined preferably by the expansion of the piece under treatment. It is evident that the application of the process is confined to pieces having practically uniform cross section such as rods, tubes, strips and sheets.

In passing, I might say that its inception and development was due the fact that Snead & Company were confronted, during the war, with the problem of heat treating a large quantity of 1"—20 gauge steel tubes about 10½ feet long. This uniformity of cross section need not be closer than that existing in commercial products and small variations such as are usually caused by the drilling of holes, in most instances do not affect the result.

It is to be noted that to cause trouble the variations must exist in a particular piece, variations from one piece to another do not affect the accuracy of operations.

ADVANTAGES OF DIRECT ELECTRIC HEATING

For work within its range, the process offers many advantages such as the speed of heating, which in most cases is less than one minute; practically no oxidation; no pyrometers required; can be operated by unskilled help; no obnoxious gases; the work while in its heated spongy condition is not exposed to injurious furnace gases; the working conditions are of the best and it will consistently produce work of great uniformity to meet very close specifications.

This uniformity is obtained not only throughout the length of an individual piece but throughout an entire lot, as the heating is under perfect control and the temperature of each piece is determined individually.

The process lends itself to semi-automatic or automatic operation and in all cases the personnel element is reduced to a minimum. For some classes of work, as with tubing, it serves as a means of inspection, as any pronounced variation in wall thickness will be shown up by uneven heating.

The current density required and the volts per foot of length are dependent upon the speed at which it is desired to heat and upon the material being handled.

The point to be noted with this method of heating as compared with heating in ordinary furnaces, whether they be fuel fired or electrically heated, is that no time need be allowed for the heat to make its way from the exterior surfaces to the interior of the mass, the heat being generated in every portion of the section simultaneously. This fact, in connection with the absolute knowledge that complete transformation has taken place, does away with the necessity of any soaking and permits speeds of heating only limited by the electrical capacity available.

COST COMPARISONS

The matter of cost is naturally an important one and with this process as with all others using electrical energy, the price we have to pay for current is a large factor. However, with this equivalent we are able to obtain a high degree of efficiency, due largely to the fact that the machine has a minimum thermal capacity. Practically the only loss to contend with, aside from those of the transformer and conductors, is due to radiation from the piece under treatment, and since the time is very short, this is comparatively small.

Even with moderately high cost electrical power the process will compare favorably with ordinary furnace methods on an overall cost basis, especially where the work is put through in small lots or at irregular intervals. There are no standby losses, the machine being put into and taken out of service with all the ease and economical handling of an electric motor. This is especially appreciated when starting up, as it is not necessary to wait for large masses of refractories to be brought up to temperature before starting.

There is a tendency on the part of those whose responsibility it is to specify heat treating and process heating equipment, not to properly consider electrical methods on the assumption that the cost is prohibitive. This convic-

tion is usually verified when comparisons are made on a heating cost basis only, using the relative prices of electrical power and oil or coal which prevail in most localities. E. F. Collins, Consulting Engineer, Industrial Heating Department of the General Electric Company has shown that with oil costing 7 cents at the burner and coal $5.00 at the boiler, there is about an even break on a B.t.u. cost basis between heating electrically and with oil. These figures are for furnace temperatures of about 1600°F. such as are required for the heat treatment of all steels other than high speed.

In making comparisons between electrical and other methods of heating, we must remember that the efficiencies shown by the electric equipment on its initial test, will be maintained practically without variation in subsequent continuous shop operation, whereas the efficiency of fuel fired furnaces will vary between very wide limits, depending upon the skill of the operator and condition of equipment. If heat treating specifications are exacting, or special conditions must be considered, the bare cost of heating is often of minor importance and electrical equipment is particularly advantageous.

In our own production, we are constantly heat treating long lengths of light gauge steel tubing, and the fact that we are doing this with practically no distortion, no scaling, with almost perfect uniformity, using unskilled help, more than offsets any possible saving that may be made, due to using oil or other fuel.

HEAT TREATING ADMIRALTY CONDENSER TUBES

I should like to say that this process may very well be applied to various heating problems of the non-ferrous industries. A particular instance is the annealing of Admiralty brass condenser tubes. Admiralty brass is an alloy of about 70 copper, 29 zinc and 1 tin and it seems that there has been considerable difficulty in properly annealing this product to satisfactorily meet the rigid specifications as to grain structure. After having successfully annealed experimentally a number of tubes for one of the largest producers of these condenser tubes, we designed and built for them a special machine to handle this material.

The work is held in a horizontal position. It was designed to work in conjunction with a 300 KVA. transformer and to heat to 500 degrees C (932°F.) 1"—No. 16 gauge condenser tubes in lengths of from 6 to 22 feet at the rate of four per minute. Heating to this temperature, the power consumption is about 1 KWH per 30 lbs. of material handled.

In this case it was somewhat difficult to determine, accurately, the cost of heating using oil, due to the fact that the furnaces were being used for various classes of heating, but one report by this user showed that even though the cost of current was about twice the cost of fuel oil, the process was, nevertheless, economical. Here again was an instance of where this increased cost of heating was more than offset by reduction in labor, lack of scaling and improved product. Tubes leaving the oil fired furnaces require a pickling operation to remove the scale, whereas tubes annealed by the electrical process are shipped as they leave the machine.

The operation of annealing as related to grain structure was changed from one involving the greatest skill and uncertainty to one permitting of the use of unskilled and untrained help, with absolute certainty of results. In fact, this particular machine is operated by two girls and recently I have seen them annealing 5/8" x .059" condenser tubes, 21½ feet long, at the rate of 10 tubes per minute; and 11 foot tubes of the same size at the rate of 14 per minute. This is at the rate of about one tube for four seconds and as the loading time of the machine is two seconds, the heating time is two seconds. These figures are not those of special runs, but were observed in the course of regular production. On another occasion I have observed this machine, still being operated by two girls, heating ¾" x .065" condenser tubes 21 feet long, at the rate of 8 per minute, or at the rate of more than 5,000 lbs. per hour.

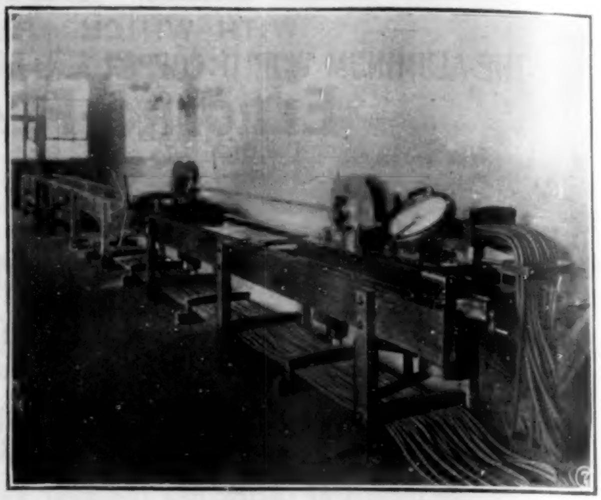

FIG. 1. FRONT VIEW OF SNEAD HB-4 MACHINE FOR ELECTRICALLY ANNEALING ADMIRALTY BRASS CONDENSER TUBES

Fig. 1 shows one of two machines recently completed. It has been improved in a number of ways as compared with earlier machines. It is designed for operation with a 500 KVA transformer and is arranged for handling tubes or rods from 6 to 30 feet in length. The right hand head is the one which moves as the tube or rod expands. The head at the left is adjustable to take care of the varying lengths of material.

The tube is shown here without support, but in actual practice inclined rails are placed every few feet to facilitate loading and to provide a runway on which the tube rolls when released from the jaws. These jaws are electrically operated by means of solenoids, the bottoms of which can be seen in this view.

When heating tubes at the speeds mentioned, current maintained and this results in powerful repulsion forces acting between the cables underneath the machine and the tube being treated. The result is that instead of the tubes sagging as they are heated, they tend to rise and float in the air. This action was very marked on the machine shown above and it was necessary to compensate for it. The cables could, of course, have been removed further from the tube, but this would involve making the machine inconveniently high, so we have provided telescoping sheet steel diaphragms running on top of the ways between the cables and the tube. With this arrangement we cannot only completely nullify this repulsive force, but by either taking out or moving some of the sections, can control it so that the tube can be made to float little or much above the supports.

Fig. 2 shows the left hand adjustable head and means provided for moving it. It is simply a capstan wheel operating pinions engaging in racks on top of the ways.

Fig. 3 shows a close-up of the right hand head with guards removed. The expansion carriage is mounted on ball bearings and is always tending to move to the right, due to the action of the weight shown. With operating handle in the off position, it is prevented from being so by a latch pin.

OPERATION OF MACHINE

The operation of this machine is as follows:

After the tube is placed in position, the operating handle is moved to the first point when the jaws are closed by the solenoids, gripping both ends. A further movement of the handle releases the latch pin, but the carriage cannot now move back due to the tube holding it in position. A further movement of the handle applies the power and the tube immediately begins to heat and expand. This

FIG. 2. SNEAD HB-4 MACHINE, REAR END

expansion is indicated on the dial, this dial having an auxiliary stationary pointer which is set to any desired temperature. When the moving pointer reaches the auxiliary pointer the primary of the transformer is automatically opened and a bell on the machine sounded. The operator turns the handle to the off position, the jaws open releasing the tube permitting it to run down the supports either into a pile or a quenching tank. In the meantime, the operator by means of a foot treadle, which has been cut off in this picture, returns the expansion head to the zero position.

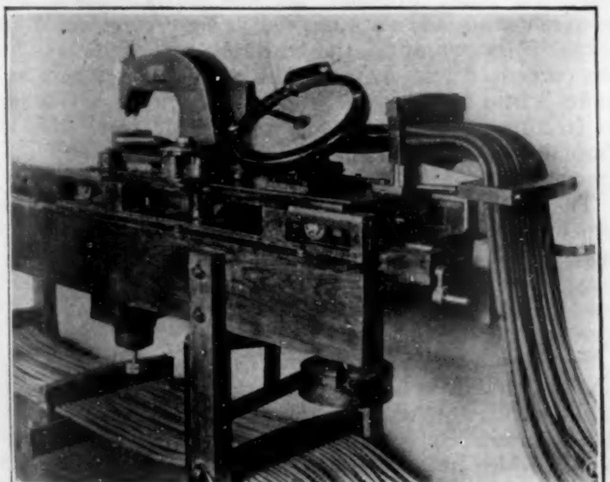

FIG. 3. SNEAD HB-4 MACHINE, RIGHT HAND HEAD, REAR VIEW

The uniform temperature does not extend to the ends of the work where they are gripped by the jaws and close to the jaws. It is our practice to allow for this and trim the ends after heat treatment where absolute uniformity is required to the extreme ends of the finished piece. We have a number of methods for heating the jaws to offset this effect to some extent and in some cases to overheat the ends, but the absolute control of this temperature is quite difficult due to the variable contact resistance.

Since the time is a matter of very few seconds, it is only through this semi-automatic action that the high speed and accuracy obtained is at all possible.

All operations of the machine which would cause trouble if not done in proper sequence, are thoroughly interlocked and the most unskilled labor can be taught to

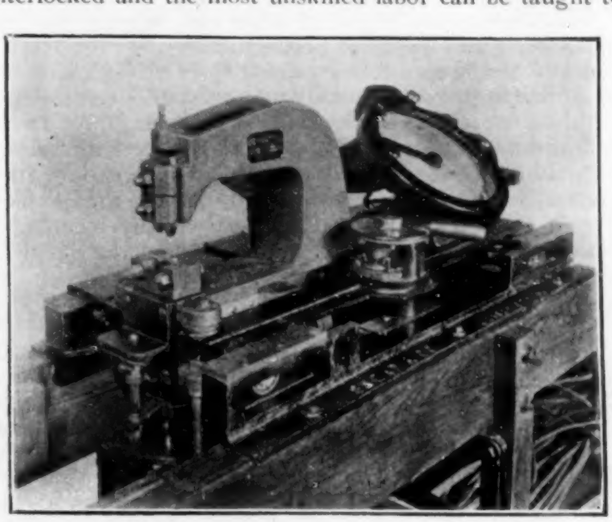

FIG. 4. SNEAD HB-4 MACHINE, RIGHT HAND HEAD, FRONT VIEW

handle the machine in a few minutes.

In Fig. 4 the hole into which the latch pin falls holding the expansion head in the zero position, is clearly shown. These yokes are heavy copper castings and the lower or movable jaw is connected to it by heavy flexible strip copper shunts, so that no current is required to flow across the sliding contact. We can also see here the top of the solenoid operating the jaw and one of the interlocking devices from which the cover has been removed.

HEAT TREATING OTHER METALS

We have done some work in connection with the heat treatment of the alloy Duralumin and have been able to harden this material properly without the necessity of soaking, as must be done when using furnaces or salt baths. As the proper heat treatment of this material calls for accurate temperature control, this process is particularly adapted to this purpose.

Due to the high rates of heating that may be obtained the process is particularly valuable for heating where the formation of oxides is to be avoided without the necessity of packing or heating in a neutral atmosphere. A particular instance is with nickel, and its alloys, such as nickel silver and Monel metal. The nickel oxide and the combination of nickel and copper oxides are very difficult to remove, but by heating all three of these metals very rapidly, in a few seconds, these troublesome formations are almost entirely eliminated.

While the process does not lend itself to the general run of heat treating problems, its field is wider than one would at first suppose, and work within its range it will handle economically, rapidly and accurately.

Abrasives

Q.—What is the best abrasive for stove castings?

A.—For your work if the castings are reasonably smooth would suggest number 60 grain for roughing, and fine down with number 80. Use oil wheel with number 160 or 180, depending on the finish required.—W. L. Abate.

Selection and Blending of Core Sands

From a Paper Read at the Syracuse Meeting of the American Foundrymen's Association, October 5-9, 1925

By A. A. GRUBB,
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There is much to be gained in the way of better castings, lower costs and increased production by the proper selection and blending of core sands. It is the writer's intention to outline in this paper some of the principles and methods which have aided us in the selection of sands for core work and in the compounding of core sand mixtures for various purposes. While chemical composition is very important in the selection of sands, I shall discuss the problem largely from a physical point of view, only mentioning those compositional constituents which should be especially sought or guarded against.

WORKING PROPERTIES OF CORE SAND

The primary properties in which the core maker is interested are green bond, dry strength and permeability. It is the green bond that determines how intricate a design he can make, handle and support on a plate for baking without the use of sand beds or metal dryers. It is one of the limiting factors on speed of production. The dry strength determines the fragility or ruggedness of the finished core and consequently the loss which is apt to be incurred between the oven and the mold. The permeability of a core sand determines the venting properties of the cores and in a measure the surface of the castings. While these properties are influenced to a degree by the kind and quantity of binder used, the sand is a very important determining factor.

Maximum green bond, maximum dry strength and maximum permeability are not readily obtainable in one and the same core sand mixture. Sands of high green bond are usually tight and require much binder. It is necessary, therefore, to shape the properties of a core sand mixture to the needs of the work for which it is intended if economy is to be attained. With this point in view a rather extensive study was made of the relation of the texture, clay and colloid content of sands to the physical properties of the core sand mixtures and cores. A presentation of the complete data would not only be time consuming but would probably be confusing so it is proposed to give only a charted summary of the results with one or two examples which are of particular interest.

Numerous mixtures of various bonding sands with sharp sands were made; the same binder and the same sand-binder ratio was used throughout. Green bond tests were made on each mixture by the old bar method[1] and test cores for permeability and dry strength tests were made and baked under as uniform conditions as possible. Test cores for permeability, two inches in diameter and two inches long, were rammed up on the standard A. F. A. rammer, baked, coated on the curved surface with paraffine, and then tested on the standard apparatus. The dry strength test was made by pulling tensile cores similar in shape to concrete test briquettes. The sands used in the experiments were examined by the standard fineness and dye adsorption tests.

A careful study of the results indicated that there were two general types of core sand mixtures, distinguished by the kind of material used to obtain green bond. We can call these for the present straight silica mixtures and molding sand mixtures. The former are very low in colloid content as measured by the dye adsorption value while the latter contain appreciable colloids.

The effect of additions of silica flour to sharp sand is very marked. It produces a higher green bond in the sand making it easier to work on intricate jobs. In fact almost any desired bond can be obtained. It lowers the dry strength of the cores, however, so that for a given strength of core more binder would have to be used. It closes up the pores of the cores somewhat so care would have to be exercised to see that they are properly vented.

TABLE 1.

FINENESS AND DYE ADSORPTION DATA ON SANDS USED IN EXPERIMENTS

	Silica Flour	Lake Sand	Molding Sand	
On 6 mesh	.00	.00	.00	.00
On 12 mesh	.00	.00	.00	.00
On 20 mesh	.00	.08	.00	.21
On 40 mesh	.02	1.44	1.44	2.79
On 70 mesh	.10	60.39	5.46	24.30
On 100 mesh	.16	34.88	27.10	25.28
On 140 mesh	.27	2.51	28.42	17.92
On 200 mesh	3.25	.32	12.98	11.80
On 270 mesh	4.89	.04	9.40	3.91
On —270 mesh	52.69	.04	5.40	4.80
Clay substance	38.62	.30	9.80	8.99
Average mesh of grain	256	52	112	91
Dye Adsorption	46	22	404	367

COMPARATIVE PROPERTIES

Straight silica sands in general require less binder to produce a given strength of core than do molding sand mixtures. This is particularly true of oil binders and in a less degree of water soluble binders. This difference in binder requirements is very important because oil binders usually represent from a quarter to a half of the cost of a core sand mixture. The straight silica sands are somewhat harsher to the feel than molding sand mixtures. They yield less under pressure, are less plastic. As a result over ramming is less apt to produce tight cores and differences in temper affect the hardness and permeability of the cores to a less degree. The cores seem to be a little more brittle while in the green state and so are subject to fracture or other damage just a little more than are those made from a molding sand mixture of the same green bond.

The straight silica cores are usually removed from castings more readily than those made from mixtures containing clay. Clay is a good bonding agent but it does not break down when struck by the heat of the molten metal. Instead it fuses into brick-like material and makes the core difficult to remove.

Certain advantages are gained, however, by the use of molding sand or small percentages of colloidal clay in core sand mixtures. Such mixtures afford maximum permeability for a given bond. In other words they are adapted to jobs which must be very open and yet cannot be made from sands of low bond. This happy combination of preperties is due to the fact that the needed green bond is obtained by coating the larger grains of the sharp sand with a quantity of very sticky colloidal clay which is small in comparison with the amount of non-colloidal but fine material which would be required to produce the same bond. The pores are thus left more open. Such clay, however, absorbs oil to a remarkable extent, hence extra binder is required.

[1] Wolf and Grubb, Lab. Testing of Sands, Cores and Core Binders, Proc. A. I. M. E., 1920.

In order to obtain the properties of a molding sand mixture it is not necessary to actually add molding sand or sticky clay. Many bank sands sold as core sands carry enough colloidal clay to give them these properties in a degree. Unfortunately the first of these properties to become evident is the oil absorbing characteristic which frequently makes them expensive to use. Furthermore it is almost impossible to remove all this clay by artificial washing. A part of it seems to be tied firmly to the grain and only the forces of nature by long continued grinding and washing can remove it. On the other hand a considerable percentage of clay substance as measured by the standard A. F. A. test does not necessarily indicate that a sand has the properties of a molding sand mixture. The dye adsorption test seems to be the only practical test we have available for measuring this important property.[2] By measuring the colloid content of clay it not only measures the sticking or bonding quality of that clay but it affords an index of its oil absorbing properties. Of sands similar in grain size and containing equal quantities of clay, those which have high dye adsorption values not only have a higher green bond strength but require more oil to bind them.

TABLE 2

Sand Data	Band Sand Raw	Band Sand Washed	Lake
Average mesh of grain	50.3	46.8	52.3
Clay substance (Per cent)..	1.04	0.40	0.80
Dye Adsorption	119.0	74.0	22.0
Core Tests:			
Sharp Sand (Parts)........	80	80	80
Silica Flour (Parts)........	20	20	20
Oil (Parts)	2	2	2
Green Bond	1.52	1.30	1.36
Permeability of Cores	106	98	102
Strength of Cores	84	97	147

Recently a bank sand very similar in grain size to a lake sand used for oil bound cores was offered as a substitute. Two grades were offered, one raw as it came from the bank and the other thoroughly washed. The prices were very attractive so comparative tests were made. This data is given in Table 2.

The strength of the baked cores is in reverse order to the dye adsorption values. A half more oil would be required to produce from the washed bank sand as strong a core as that produced from the lake sand by two parts of oil. Complete cost calculations show that, although the bank sand could be laid down at the plant for a dollar less per ton than lake sand, the additional oil required to bind it would more than offset this difference and would entail a loss of some forty cents per ton.

Similar tests show that the white silica sands from the region of Ottawa, Illinois, which have low dye adsorption values, require still less oil to bind them than do the lake sands. They are, therefore, very desirable for oil bound cores provided the cost does not offset the saving in binder.

In case it is found necessary to use the more open but higher bonded molding sand mixtures which ordinarily are great oil absorbers, conditions may permit the use of the cheaper water-soluble binders or part water-soluble and part oil. The differences in binder requirements are then not so pronounced nor are they so expensive. It is not within the scope of this paper to discuss the conditions under which such binders prove satisfactory; this phase of the problem, however, is a most fruitful one for investigation.

The benefits to be gained by proper selection and blending of core sands are very real. The writer has record of a case where molding sand costing $3.00 per ton was replaced with a silica wash costing $6.50 per ton, in an oil bound sand. The change actually netted a reduction of 10 per cent in the cost of the core sand mixture due to saving in binder and reduced the labor of knocking out the cores more than 50 per cent. In another case a blended sand mixture containing molding sand was replaced by a straight bank sand which carried the desired grain and clay content; the change in this case netted a saving of seventy cents per ton or $12.00 per average working day.

The problem of selecting and blending core sands is not a simple one. It presupposes a knowledge of the requirements involved in making and handling the green core, in handling the baked core, in getting a perfect casting over the core and finally in getting the core out of the casting. Frequently it involves balancing one property against another and choosing that mixture which will give best results at reasonable cost. Thorough knowledge of the sand characteristics, however, enables one to arrive most definitely at the proper mixture with the least trouble and delay.

[2] H. M. Lane, The Core Room: Its Equipment and Management. Trans. A. S. M. E., Vol. 30, p. 776.

The Life of Molding Sands

By C. M. Nevin, Ithaca, N. Y.*

This paper deals with the series of investigations made with a view to determining the factors affecting the durability of molding sand. It is a common practice to speak of the long-lived and short-lived sands meaning that certain types do not burn out as fast nor need as much replenishing with new sands as do other less durable sands, yet those factors which go to make these differences are little understood. This paper first discusses all factors which affect the life of the sand. These are listed as follows: quality of bond; amount of bond; rehydratability; oxidizing and reducing conditions; fusion point; size of casting; pouring temperature permeability to gases; tempering water; and character of metal. The author then discusses the structure of the bond of various types of sand which is considered to be largely a matter of the colloidal character. Following this, details of the various series of tests are given. Castings were poured under uniform conditions, using some twenty types of sands. Methods of determining the life of the sand were worked out and checked against each other.

*Abstract of a paper read at the Syracuse Convention of the American Foundrymen's Association, October 5-9, 1925.

The Qualities of Commercial Core Oils

By H. L. Campbell, Ann Arbor, Michigan *

With the purpose of establishing some method for determining the relative qualities or values of oil binders for cores, a study was made of the properties of twenty-three commercial core oils. In this investigation, the chemical and physical properties of the core oils, were obtained as well as the physical properties of the cores made with the oils in order to note any relationship in these characteristics. The properties of the core oils determined were specific gravity, refractive index, iodine number, and unsaponifiable matter. The strength of cores baked at temperatures ranging from 375 to 500 degrees Fahr. were determined by means of a special transverse testing machine. Some of the conclusions reached were: (1) That as commercial core oils are prepared from so many different drying oils and other materials having various chemical and physical properties, it is impossible to establish the value of an oil as a binder on the basis of any chemical or physical property of the oil; (2) The bonding property of core oils may be determined accurately by making test cores in a uniform manner, baking these cores under definite conditions and measuring the transverse strength of the cores.

A List of Alloys

Reprinted from the Booklet Published by the American Society for Testing Materials. Part 13*

By WILLIAM CAMPBELL†

PLATINUM, ETC.

	PLATINUM PT	GOLD AU	SILVER AG	OTHER ELEMENTS
Thermo-couples	90.	....	....	Ir, 10.
Thermo-couples	90.	....	....	Rh, 10.
Solder	27.	....	73.	
Resistance	33.3	....	66.6	
Platine-au-titre	17–35	....	83–65	
Platinum-Gold:				
White	40.	60.	....	
Almost White	30.	70.	....	
Almost White	58.3	16.6	25.	
Cooper's Gold	18.75	....	....	Cu, 81.25
Cooper's Gold	29.17	....	....	Cu, 66.6; Zn, 4.15
Cooper's Pen Metal	50.	....	37.5	Cu, 12.5
Cooper's Pen Metal	....	25.	25.	Cu, 50.
Cooper's Mirror	9.5	....	....	Cu, 58.; Sn, 27.5; Zn, 3.5; As, 1.5
Palladium Gold	....	31.	19.	Pd, 10.35; Cu, 39.65
Platinum Substitutes:				
Palau	....	80.	....	Pd, 20.
	20.	....	....	Ni, 60.; Pd, 10.; V, 10.
Cooper's	25.	....	70.	Ni, 5.
Cooper's			70.	Co, 5.; Pd, 25.
Electrical	7.5	67.5	25.	
Electrical	5.	70.	25.	
Electrical	....	70.	25.	Ni, 5.
Proplatinum	....	0.75	23.5	Ni, 72.; Bi, 3.75

RESISTANCE ALLOYS

	NICKEL NI	CHROMIUM CR	IRON FE	MANGANESE MN	COPPER CU	ZINC ZN	OTHER ELEMENTS
Advance	44.3	....	0.5	1.15	53.9	....	
Argentan	26.	....	1.	....	56.	18.	
Calido	64.	8.	25.	3.	....	....	
Calorite	65.	12.	15.	8.	....	....	
Calorite	65.	12.	23.	....	....	....	
Chromel A	80.	20.	....	....	....	....	
Chromel B	85.	15.	....	....	....	....	
Chromel C	64.	15.	25.	....	....	....	
Climax	24.4	....	73.	2.6	....	....	
Comet	30.4	2.2	66.9	0.8	0.4	....	
Constantin	46.	....	....	....	54.	....	
Constantin	43.9	....	0.4	1.34	54.15	....	
Dilver	(See Platinite)						
Eureka	(See Manganin)						
Excello	85.	14.	0.5	0.5	....	....	
Fermet	18.	4.	Bal.	2.2	0.3	....	W, 0.5–1.0; C, 0.35
Ferrozoid	Nickel steel						
Ia-Ia	40.	....	....	....	60.	....	
Ideal	45.	....	0.66	0.45	53.4	....	Al, 0.66
Ideal	40.	....	1.	1.	58.	....	
Invar	36.	....	64.	....	....	....	
Kromax	80.	20.	....	....	....	....	
Kromore	85.	15.	....	....	....	....	
Kruppin	28 per cent Nickel		Steel				
Lucerno	67.9	....	2.4	2.2	27.5	....	
Magno	95.	....	....	5.	....	....	
Manganese Steel	....	....	Bal.	12.	....	....	C, 1.2
Manganin	4.	....	....	12.	84.	....	
Manganin	2.	....	....	12.	86.	....	
Manganin	12.	....	....	4.	84.	....	
Manganin	2.3	....	0.6	15.	82.1	....	
Manganin	5.	....	....	25.	70.	....	

*This booklet can be obtained from THE METAL INDUSTRY for $1. Parts 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 appeared in our issues of March, April, May, July, September, December, 1923; June, July, August, September, 1924, May and June 1925.

†Professor of Metallurgy, School of Mines, Columbia University, New York.

	NICKEL NI	CHROMIUM CR	IRON FE	MANGANESE MN	COPPER CU	ZINC ZN	OTHER ELEMENTS
Marsh's Patent	75.	25.	....	....	....	....	
Monel	67.1	....	2.1	1.7	28.4	....	
Nichroloy	75.	16.	8.	3.	....	....	
Nichroloy	40.	7.	50.	3.	....	....	
Nichroloy	23.	20.	50.	1.	....	....	
Nichrome I	60.	11.	25.	4.	....	....	
Nichrome II	75.	11.	12.	2.	....	....	
Nichrome	66.	22.	10.	2.	....	....	
Nickelin	18.	....	....	....	62.	20.	
Nickelin	32.	....	....	....	68.	....	
Nickelin	31.5	....	....	....	55.3	13.1	
Ni-Cr-Cu	80.	25.	....	....	20.	....	
Ni-Cr-Cu	85.	20.	....	....	15.	....	
Ni-Cr-Al	88.	8.	....	....	....	....	Al, 12.
Non-Magnetic High Resistance	30.	70.	....	....	....	....	
Phenix	25.	....	75.	....	....	....	
Placet	60.	15.	20.	5.	....	....	
Platinite	46–12	....	54–58	....	....	....	
Platinold	24.27	....	0.47	0.15	54.	20.4	
Platinoid	14.	....	....	....	60.	24.	W, 1–2
Rayo	85.	15.	....	....	....	....	
Resistin	....	....	1.8	11.7	86.5	....	
Resistin	....	....	3.	12.	85.	....	
Rheotan	....	....	12.	2.	84.	4.	
Rheotan II	25.	....	5.	....	52.5	18.	
Silver Bronze	....	....	....	18.	67.5	13.	Al, 1.25; Si, 0.25
Tarnac	(See Manganin)						
Tico	30.4	....	67.3	1.12	1.1	....	
Tophet	61.	10.	26.	3.	....	....	
Vestalin	(28 per cent Nickel Steel)						

HEAT RESISTING ALLOYS

	NICKEL NI	CHROMIUM CR	IRON FE	COPPER CU	MANGANESE MN	OTHER ELEMENTS
Armstrong	....	12.	Bal.	....	....	Si, 5.; C, 0.45
Calite	35.0	5.0	50.0	....	....	Al, 10.0
Clebrium	2.0	13.1	Bal.	....	0.75	Mo, 3.6; Si, 1.5; C, 2.6
Clebrium	4.6	18.5	Bal.	2.	2.8	C, 2.0
Cobaltcrome	....	13.6	79.5	....	0.2	Co, 3.7; Mo, 0.8; Si, 0.8; C, 1.5
Duke's Metal	....	11.76	80.8	....	0.2	Si, 0.6; C, 1.45; Co, 4.; W, 0.35
Flame Resisting	9.7	14.	Bal.	....	0.77	Si, 0.2; C, 0.23
Ludlum	....	13–17	Bal.	....	....	Si, 1.; C, 0.4; Mo, 1
Monel Metal.						
Nichrome	70.3	20.	6.9	....	1.9	Si, 0.5
Nichrome	53.7	16.7	22.4	....	1.4	Si, 1.0
Nichrome	80.	13.55	4.8	....	....	Si, 1.3
Nichrome	60.2	11.1	27.2	....	1.2	C, 0.3
Nichrome	61.2	9.9	26.9	....	1.0	Si, 0.3
Nichrome	64.7	13.3	6.4	11.	0.63	Si, 3.36; C, 0.35
Nichrome	70.3	13.2	7.25	3.25	0.2	Si, 3.7; Mo, 1.33
Nichrome	67.8	11.3	6.95	7.1	....	Si, 4.65; Ti, 0.25
Nichrome	62.	13.	20.	....	5.0	
Nickel Steel	30.	1.0	Bal.	....	1.0	
Resistal	16.56	15.14	Bal.	....	....	Si, 4.66; C, 0.3
Silchrome	....	9.5	Bal.	....	....	Si, 4.; C, 0.5
Silchrome Wire	....	18.	Bal.	....	....	Si, 3.; C, 0.3; W, 3.

This List will be concluded in an early issue.—Ed.

Electric Melting of Nickel-Iron Alloys*

One of the recent developments in ferrous metallurgy is the manufacture of small tonnages of nickel-iron alloys practically carbon free. The high frequency induction furnace has figured largely in this development. Permalloy, which consists of about 78½ per cent electrolytic nickel and 21½ per cent electrolytic iron was developed with the aid of one of these small furnaces in a laboratory of the Western Electric Company in New York. In 1922 two 100 pound furnaces were installed at the Hawthorne plant of the Western Electric company in Chicago. It was specified that the carbon content should not exceed .06 per cent. When the writer was installing this equipment ten successive 100 pound melts of permalloy were made of which the carbon content was reported as .01 per cent, or one point of carbon in foundry parlance.

An alloy of 50 per cent electrolytic iron and 50 per cent electrolytic nickel is being manufactured at the Westinghouse Electric & Mfg. Company in a 225 pound high frequency induction furnace.—DUDLEY WILLCOX.

*From a Paper Read at the Convention of the American Foundrymen's Association in Syracuse, N. Y., October 5-9, 1925. See THE METAL INDUSTRY, October, 1925, page 401.

Cooling Fractures in Journal Brasses

How Cracks, Supposedly Due to Shrinkage Were Prevented by Attack from Another Angle

Written for The Metal Industry by R. R. CLARKE, Foundryman

Lines of cleavage in journal brasses (Fig. 1) have always been commonly credited to cooling strains unless serious errors in molding practice could be otherwise found. These cleavage lines, it will be observed, occur frequently between the collar and the body of the lining and also on the journal side of the lining. In the former case the fracture line strikes deeply into the metal and extends approximately two-thirds from the crown of the brass down either side. In the journal fracture the line is also of damaging depth and runs longitudinally along the crown throughout the practical entity of the brass. A sharp edge rather than a rounding fillet between the collar

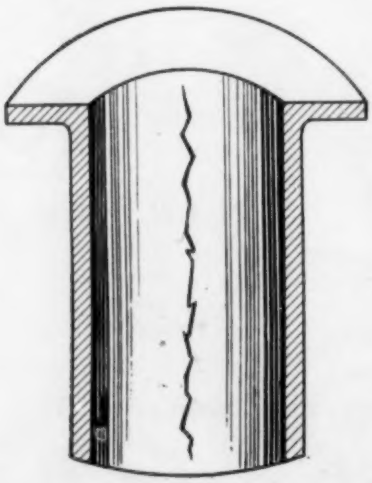


FIG. 1. "SHRINK" CRACK IN BORE OR JOURNAL OF ENGINE BRASS; USUALLY CONSIDERED RESULT OF COOLING STRAIN. FACING SAND USED IN GREEN STATE ON DRY SAND COMPLETELY OVERCOMES IT.

FIG. 2. SHRINK CRACK IN FILLET OF ENGINE BRASS BETWEEN COLLAR AND BODY OF BRASS.

and the body of the casting (Fig. 2), is a pattern fault conducive to the cleavage line in the casting. Molding errors tending to the same effect are improper gating, sand too wet, or rammed excessively hard or insufficiently vented, incorrect pouring temperature of the metal, and insufficient height of the cope of the mold. These same molding errors apply to the journal fracture. In spite of the best molding practice, however, the defect will often prevail and it is then that cooling strain is usually held accountable.

The collar or flange of most axle brasses is far more bulky than the body metal. It is therefore quite reasonable to conclude that the cooling strain produced by the varying contractions of the varying of bulks result in the cleavage line. As a mere matter of shrinkage the trouble is quite susceptible of solution through a change in gating practice. Nevertheless, in spite of all gating the difficulty persists.

The whole idea of the cleavage line resulting from shrinkage is the simple fact that the lighter metal in the body of the brass solidifies at a time when the heavier metal in the flange is in its plastic state, a state in which it is helpless either to resist the pull of the solidifying body metal or to compensate for it. For years the author worked against the difficulty on this principle and with this understanding, but a thorough and intensive investigation over a period of some 15 months has convinced him that other forces produce it. Contraction could easily produce the line between body and flange when bulk varies but how could it do it in the journal where bulk is uniform? The fact is that it could scarcely do it; nor does it do all of the damage between body and flange. The other contributing factor is steam or gas pressure.

I was led to suspect this as a probable cause from the observation that when the sand was used less damp, or in the case of dry cores to displace green sand, the trouble was always far more rare. In the heavier castings, this gas pressure is strong by the time the casting metal has reached its plastic state, a state in which the least disturbance will work havoc with it. This gas pressure working on the plastic casting may not be great enough to move the casting against the outer bounding surface of the mold but it is enough to hold it against these surfaces as contraction sets in. Being unable thereby to close in with contraction, it simply stands slightly apart producing the cleavage line.

To overcome the difficulty it was assumed that if a thin crust of sand, hard and impervious to pressure surrounded the casting surface then the gases could not get at the casting but would seek the line of less resistance through the background sand. This led to the use of a facing of 30 parts Albany sand of rather coarse grain to 1 part of flour or Kordek as a binder. The facing was used in green state, though very much on the dry side, and covered the offending surfaces to a depth of 1/4 inch. With this practice thousands of brasses have been made with no indication whatever of the check or cleavage line. Besides, cutting of the mold, scabbing, etc., have also completely disappeared. The explanation of the whole matter no doubt, is that as soon as the liquid metal strikes the facing sand, it forms the crust which is what was desired and all that is needed.

New American Standard Sizes of Crucibles*

No.	Height	Top	Bilge	Bottom	Approx. Cap. in Lbs. Water†
10	8 1/16	6 1/16	6 9/16	4 13/16	4.8
12	8 1/2	6 3/8	6 7/8	5 1/16	5.6
14	8 7/8	6 11/16	7 3/16	5 1/4	6.4
16	9 1/4	6 15/16	7 1/2	5 1/2	7.2
18	9 13/16	7 5/16	7 13/16	5 13/16	8.6
20	10 5/16	7 11/16	8 3/8	6 1/8	10
25	10 15/16	8 3/16	8 7/8	6 1/2	12
30	11 1/2	8 5/8	9 5/16	6 13/16	14
35	12	9	9 3/4	7 1/8	16
40	12 1/2	9 3/8	10 1/8	7 7/16	18
45	13 3/16	9 7/8	10 11/16	7 13/16	21
50	13 3/4	10 1/4	11 1/8	8 1/8	24
60	14 7/16	10 13/16	11 11/16	8 9/16	28
70	15 1/16	11 1/4	12 3/16	8 15/16	32
80	15 5/8	11 11/16	12 11/16	9 1/4	36
90	16 3/16	12 1/8	13 1/8	9 9/16	40
100	16 11/16	12 1/2	13 1/2	9 7/8	44
125	17 3/8	13	14 1/16	10 5/16	50
150	18 3/8	13 3/4	14 7/8	10 7/8	60
175	19 1/4	14 3/8	15 9/16	11 3/8	70
200	20	15	16 1/4	11 7/8	80
225	20 3/4	15 1/2	16 13/16	12 5/16	90
250	21 3/8	16	17 5/16	12 11/16	100
275	22	16 7/16	17 13/16	13	110
300	22 1/2	16 7/8	18 1/4	13 3/8	120
400	24 5/16	18 3/16	19 11/16	14 7/16	160

*From a pamphlet published by the Plumbago Crucible Association.

†1 lb. water = .96 pints or 27.7 cubic inches. Dimensions given are outside dimensions in inches.

How To Cut Crucible Costs

An Article from a Pamphlet Published by The Plumbago Crucible Association

UNPACKING

Be sure that all nails are carefully drawn from the package so that crucibles will not be scratched or gouged on removal.

STORAGE

Crucibles should be unpacked as soon as received and stored at once in a warm, dry place.

Crucibles should be kept in a warm, dry place at least two weeks before using, and as much longer as possible. The longer they are kept in the foundry under correct conditions, the better will be the results from them.

Suitable storage places are on top of the core oven, on top of the furnace flues, or some similar warm, dry place.

Never store crucibles on the ground.

Do not place crucibles in cold draft or near open door in winter time.

Do not store crucibles in core oven as the moisture from damp cores is taken up by the crucibles. See a succeeding section as to the effects of dampness.

STORAGE OVEN

Foundries that get the best results from their crucibles use a specially constructed crucible storage oven and such an oven cannot be too highly recommended. It pays for itself in crucible results.

The ideal storage oven is one in which crucibles can be stored on open shelves, away from a cement or earthen floor at a minimum temperature of about 250° Fahrenheit. It should be heated by radiated heat. This can be supplied most of the time by by-passing around its outer shell the waste gases from the core ovens or furnace flues.

Direct flame should never be admitted to the storage oven, as it produces or condenses a certain amount of moisture which is at once absorbed by the crucibles.

DAMPNESS

The main ingredients of plumbago crucibles are graphite and clay. The clay content, by nature, will absorb moisture as readily as a sponge.

Before leaving the manufacturer's plant, crucibles have been thoroughly kiln-dried until all moisture has been driven out. But the moment they strike the air outside they begin to pick up moisture again.

Sometimes shipments of crucibles while in transit will pass through heavy rains or snows, as a result of which they will absorb an almost incalculable amount of moisture.

This moisture must be driven out by the user. It must be expelled slowly and completely before the crucible can be used.

If a crucible that contains relatively a considerable quantity of moisture is quickly subjected to a high degree of heat the moisture will rapidly turn to steam that will be under pressure. The pressure will force the steam out in a hurry, resulting in a scalped or spalled crucible.

If the quantity of moisture is slight so that not enough steam pressure is produced to cause a scalp or spall, it may then disrupt the structure of the crucible internally and cause a great number of fine internal cracks that will not be visible to the eye. After one or more heats, the molten metal will find these cracks and force its way out, forming a pin hole. Or else the continued pressure on a weak spot of this kind will cause a crack or split.

No matter how small an amount of moisture may remain in the crucible when it is put in the furnace, it will shorten the heat life.

The same strains, with their final ill effects, will result from dropping or banging the new crucible around.

The foundryman who will always assume that his crucibles are damp when they reach him will never have any scalped pots, for he will always give them the proper care.

PREHEATING

Before annealing, crucibles should be preheated for at least a number of hours, and preferably for two or three days, but placing them near the furnace, or some place where they will be heated to a temperature above 212 degrees Fahrenheit (the steam point), assuming that they have not been kept at this or a higher temperature in a storage oven. This is safety precaution that will pay well.

ANNEALING

Crucibles should be annealed slowly. The first heat is the critical one and the temperature should be brought up very slowly.

Place crucibles upside down in a cold or almost cold furnace. Never put new crucibles in a hot furnace.

In the case of a coal or coke furnace, new crucibles should be started on their first heat with a new fire.

When the crucibles reach a cherry red color, turn them right side up, charge them, and put them to work.

Where oil or gas furnaces are used, put the crucibles in a cool furnace, with only the flame turned on. Add just enough air-blast to bring the temperature up very slowly until the crucibles are a cherry red color.

Never throw the air-blast on new cold crucibles.

A neglect of the foregoing suggestions may result in scalping or internal fractures.

It is a good plan to have in reserve a number of crucibles that have been annealed and used for a heat or two of melting, so that in case of a failure during the day a thoroughly annealed and vitrified crucible will be ready for instant use.

Where several metal mixtures are melted in a plant, new crucibles should be started off on the highest temperature metal, and used later for lower temperature ones, in this order: nickel, copper, brass, aluminum. In other words, crucibles should be given their hardest service when they are new and best able to stand it.

CHARGING

Metal should be so placed in crucibles as to avoid possibility of wedging. When heated the metal expands more than does the crucible, so that if wedged it will crack the crucible.

Ingots or heavy pieces of metal should not be dropped or thrown into the crucibles.

After the first charge has started to melt and additions are to be made, it is essential that all metal be pre-heated (placed on top of the furnace cover). If cold metal is put in with the molten metal it will result in a "chillback" and cracking of the crucibles.

When borings are to be run down, start the heat with a few gates or sprues.

Avoid fluxes unless absolutely necessary. Where used, it is good practice to add the flux after the metal has started to melt. Never melt a flux in the bottom of the crucible.

All basic fluxes directly attack the crucible structure and shorten its life. Charcoal is the only material so used that does not have an ill effect on crucibles.

Scrap metal should be thoroughly inspected, particularly scrap valves, which should be opened and drained.

Crucibles should be recharged and returned to the furnace immediately after pouring, if possible.

FURNACE TENDING

Care must be taken that there is an even heat distribution. In other words, it is essential that the crucible be set in the exact center of the furnace so that there is an even combustion space between the furnace wall and the crucible all around. This applies to all types of furnaces, regardless of fuel used.

There should be about three inches of coke space on sides and six to ten inches of fuel under the crucible depending upon its size.

Furnaces, whether square or round, should be deep enough to insure the top of the crucible never being higher than the bottom of the flue.

Where the crucible is placed in a tilting furnace, if wedges are used they should be placed so that the subsequent expansion may be taken care of.

Tilting crucibles should be placed on a crucible rest or base block of good quality. This will eliminate the settling of the crucible and the hazard of breakage from throwing the weight on the wedges.

At least an inch of clearance should be allowed between the underside of the tilting crucible spout and the furnace lining, so that in case the crucible should settle slightly, the load will not be thrown on the spout.

It is important that the bricks in the furnace are not worn or bellied in.

Furnace linings are most efficient when new. When linings burn back (referring especially to oil and gas fired furnaces), the combustion space is increased, which decreases the efficiency of combustion. Because of this, more fuel is used, and it requires more time to melt the metal. And the irregular shape of the partially burned out lining distorts the natural path of travel of the flame. Therefore furnace linings should be maintained in their original shape by proper patching and repairing. It will save money for the foundryman.

Avoid hard, sharp pieces of coke under crucibles.

Care must be exercised in stirring the metal and where coal or coke is used, in poking the fire. Many failures are caused by carelessness in these operations, due to the furnace tender poking a hole in the pot by too strenuous manipulation. The end of a stirrer should be ball shaped and it should never be used until it is worn to a point. It is very easy to punch a hole through a hot crucible.

FUELS

Fuel must be kept in a dry place. Wet coal or coke will produce steam and moist gases and should never be used, as it will cause scalped crucibles.

A high percentage of sulphur in the fuel will shorten the life of the crucibles.

In the use of oil or gas fuels, it is important to secure perfect combustion. If too much air is used it will create an oxidizing condition that will consume the graphite or carbon in crucibles and rapidly exhaust it.

Too much oil produces an excess of moist gases which attack the crucibles and cause what are known as checkerboard cracks.

POURING

Leaving the metal in the fire after it is ready to pour (usually called "soaking") is to be avoided, as it is exceedingly hard on the already softened pot.

It is essential that moulds be ready for pouring at the same time as the metal is melted. This not only saves fuel, but greatly increases the life of the crucible.

For pouring, crucibles specially made for that service can be had. Otherwise, use an old crucible that is well glazed, or run a new crucible several heats in melting service to bring out the glaze.

Tongs should grip well below the bilge line to prevent crushing. Crucibles are pliable when hot and gripping them at the top is careless practice and causes unnecessary trouble.

Crucibles should be set in a bed of dry sand when removed from the furnace.

Clinkers should be removed from the sides of the crucible as the tongs are put on and from the bottom of the pot before it is set on the floor. Clinkers left on the sides will puncture the crucible if the tongs should happen to be placed over them. Clinkers on the bottom will puncture the crucible when it is placed on the floor.

Do not permit the last of a heat which cannot be used for casting to remain in the crucible after the moulds have been poured. Any slag that remains should be removed while the crucible is still hot.

Crucibles should always be emptied at the close of the day's work. This will save many bottoms from falling off or being cut off by expansion of the "button."

Crucibles should be permitted to cool slowly if they are not to be refilled. They should never stand in a draft from an open doorway or window.

TONGS AND SHANKS

These should be designed to the American Standard of crucibles sizes. They will then fit the crucibles made by any of the manufacturers named in this booklet.

Tongs and shanks not only should fit properly to start with, but care should be taken to keep them in good condition and they should be refitted at least once a week so as to eliminate unnecessary abuse and squeezing of crucibles which causes cracks and leaks.

Ill fitting tongs are extremely detrimental and the cause of a large percentage of crucible troubles. They should grip the crucible firmly and safely, and without crushing it. Many crucibles have been ruined through poor fitting hardware.

For pots holding over 150 pounds of metal, tongs with double prongs and preferably of the "grab" pattern, should be used.

Shanks of the plain ring type, with a wide ring properly tapered, are best.

It is a good plan to have two sets of tongs and shanks, one for use with new crucibles and one for use after the crucibles have worn.

If it is necessary to fill out for a well-worn crucible, a broad clip or wedge should be provided so as not to cut into the wall of the crucible. Never use gates or sprues in the shank.

The shaping of tongs is facilitated by the use of an iron mould the same size and shape as the crucible.

COLD WEATHER

Foundrymen should use a little more care and a little longer time than usual in preparing crucibles for service in cold weather. Users who never have trouble in warm weather will have it in cold weather.

Winter weather brings not only lower temperature but greater humidity (moisture). Manufacturers' records show that nearly all of the reports of scalped or spalled crucibles come from winter service.

CRUCIBLES FOR VARIOUS CONDITIONS AND MIXTURES

The foundryman knows that he cannot produce from one mixture a metal suitable for all conditions and classes of work, neither should he expect that one mixture of clay and graphite will produce a crucible that will show satisfactory results under all conditions.

Plumbago crucibles are manufactured of different mixtures for use under varying conditions; i.e., with coal, coke, gas, etc., and with due consideration to the class of metals to be melted. If details are given on these points when ordering crucibles, the results will often be beneficial to all concerned.

Deposition of Metals Upon Stainless Steel

Experiment on the Electro-Plating of Various Metals Upon High Chromium Steel

Written for The Metal Industry by JOSEPH HAAS and ELMER R. UNRUH

There have appeared from time to time, inquiries on depositing silver, copper, and nickel upon stainless or high chromium steel. The persons sending out such inquiries no doubt have found that stainless steel does not permit of the same treatment as any of the carbon steels to obtain adhesive deposits. Replies to such inquiries have been various.

Stainless steel may be plated for many reasons. In the cutlery business there are many knives that have stainless blades and carbon steel handles welded to them. The weld is located in the bolster, and this junction is an indeterminate or irregular line. So, in order completely to deposit the ordinary steel handle with silver, it becomes necessary to deposit silver partly on the stainless steel. If the usual methods of plating steel are followed, the silver deposit will not adhere to the stainless steel, and can be stripped back to the weld. If the weld is irregular this presents a bad appearance besides involving expense in removing the silver back to the weld. Therefore it is desirable to have the silver adhere to the stainless steel that forms part of the bolster, thus covering up the irregular weld and presenting a better appearance at a lower cost. From the nature of some of the inquiries it has been concluded that it is desirable to plate stainless steel in other industries, more probably to match up in finish, or for decorative reasons.

Several acid dips were first tried, but results were either entirely unsatisfactory or inconsistent. Then attention was directed to acid employing an electric current. The best results were obtained from the following:

1. Sulphuric acid............. 25%
   Lead anode
   Stainless steel as cathode
   Voltage 4-6
2. Hydrochloric acid........... 30%
   Carbon anode
   Stainless steel as cathode
   Voltage 4-6
   Temperature 140° F.

These solutions, particularly the latter have been in use for two years as a preparatory means employed on stainless steel. Complete operations used are:

1. Boiling in electric potash cleaner
2. Rinse in clean water
3. Submit to the action of electric current in hydrochloric acid solution at 140° F.
4. Rinse in clear water

[Repeat 1, 2, 3, and 4.]

5. Dip in concentrated hydrochloric acid solution
6. Rinse in clean water
7. Nickel plate
8. Rinse in clean water
9. Silver strike
10. Silver plate

The plating of stainless steel remained in that state, as far as the writers were concerned, as they had obtained the results desired, until recently, when repeated inquiries were made. The following is the result of the further investigations:

COPPER PLATING—PLATING IN CYANIDE SOLUTIONS

A copper syanide solution was made up or the following composition:

Copper cyanide	4½	ozs.
Sodium cyanide	4	ozs.
Sodium carbonate	2	ozs.
Water	1	gal.

High carbon steel plated in this solution satisfactorily employing the usual cleaning methods. Results on stainless steel follow:

	Regular Preparatory Treatment	Stainless Preparatory Treatment
Voltage	3.0	3.0
Amps.	96.0	96.0
Current Density, Amps/sq. ft.	10.0	10.0
Time of Deposition	10 minutes	10 minutes
Result	Badly blistered Non-adherent	Badly blistered Non-adherent

These results had been anticipated, as in the experiments performed to find a satisfactory treatment for stainless steel a 6-ounce per gallon solution of sodium cyanide had been used with an electric current, on the theory that chromium in stainless steel probably caused the surface to be in a more oxidized state than in carbon steel, and that the large evolution of hydrogen gas at the cathode would destroy this oxidization. This theory proved fallacious. The only satisfactory treatment was found to be to submit the steel to the action of a direct electric current in an acid solution. That stainless or high chromium steels cannot be plated direct in cyanide solutions was proved by attempting deposition in cyanide copper, brass, zinc and mercury-zinc solutions.

Cyanide appears to be detrimental to the surface of stainless or high chromium steel as shown by the following:

Stainless steel was given the special preparatory cleaning process, but instead of placing in the nickel solution was left for one-half an hour in a cyanide dip. Then part of the stainless steel was rinsed thoroughly in water and nickel plated. The remainder of the stainless steel was rinsed in water, dipped in concentrated hydrochloric acid, rinsed and nickel plated. On both lots the nickel deposited flaked off.

It was decided to try dip methods again, as they seemed to be advocated. To that end the following dips were tried:

1. Water .... 1 gal.
   Sulphuric acid .... 12 ozs.
   Sodium Chloride .... 4 ozs.
   Used at 140° F.
2. 20% Sulphuric acid
   Used at 140° F.
3. Concentrated Hydrochloric acid
   Used at 145° F.

The first results obtained from these dips were entirely unsatisfactory. The reason for this was discovered. The stainless steel must be left in the acid dips until a vigorous evolution of hydrogen gas has occurred off the surface. After rinsing thoroughly, the stainless steel must be quickly placed in the nickel solution.

SUMMARY OF RESULTS

Of all the methods tried in preparing the surface of stainless steel for deposition a concentrated hydrochloric acid solution at 140° F. used with a direct electric current gave the best results. In using immersion dips, it was noticed that an evolution of gas was produced after a few seconds immersion. Gas evolution was most vigorous in the case of the 20% sulphuric acid solution at 140° F., and this dip gave the best results for immersion methods.

Inquiry into why it is more difficult to obtain adherent deposits upon stainless steels than upon carbon steels does not very readily bring forth an answer. The statement that stainless steel should not be more difficult to plate will not be admitted by those who have tried it. In an effort to find an answer, a few potential difference measurements were made. In a cell consisting of nickel solution, and electrodes of nickel and carbon steel, 0.2862 volts was obtained with the current in the cell flowing from the steel to the nickel, while a cell containing nickel solution and electrodes of nickel and stainless steel gave but 0.0153 volt with the current flowing from the stainless steel to the nickel. From a potential viewpoint, one would anticipate less trouble in plating stainless steel than in plating carbon steel. Probably the answer could be found in passivity of which there seems to be no satisfactory explanation. However, it appears to be agreed by all that passivity may be due to oxygen or oxide on or in the metal. If not entirely caused by this, it is at least closely associated with it. When it comes to the solution of metals in a passive state, it has been found that the metal resists solution until a sufficient potential has been applied to destroy this film. Or, as in the case of nickel anodes, that the solution contains such a corrosive material as chlorides to prevent the nickel anodes from becoming passive. In recent literature on deposition it has been claimed that the best deposits are obtained when the surface crystals are so prepared that the crystals of the deposited metal will unite with or adhere to those of the base metal and not merely be deposited upon the base metal.

It thus seems that to obtain an adhesive deposit on stainless steel the surface passivity must be destroyed, and while the surface crystals are in a non-passive state, immediately plated in an acid solution. The acid solution probably aids in retaining this surface non-passivity better than alkaline solutions.

Antique Silver

Q.—We are sending you under separate cover sample of metal of which we have about 1,500 articles to plate. These articles are to be finished as sample. Also, our customer desires to have some of them finished in silver with a greenish tint to the background. Kindly let us have your suggestions in regard to solution and process in order to arrive at the desired result.

A.—The sample you have submitted for finish is commercially termed oxidized silver, antique silver, or silver gray finish. When the background is of a bluish-green tint, the finish is termed casket hardware green. The method of producing these finishes is identical. The procedure is as follows, presuming that the base metal is antimonial lead. The surface should be cut down with tripoli composition or white diamond to a smooth surface. The articles should then be washed to remove the excess of buffing greases, etc., in benzine or gasoline or in heated kerosene oil. Dry out in sawdust, preferably maplewood. Cleanse again in any good after-cleaning alkaline cleaner, that contains caustic potash or soda. After cleansing in the hot cleaner, wash thoroughly in cold water, immerse in a cyanide dip composed of water 1 gallon; sodium cyanide, 96-98 per cent, 6 ozs.

Wash again in cold water, nickel plate for a short time; minimum 10 minutes. Nickel solution: water, 1 gallon; single nickel salts, 10 ozs.; sal-ammoniac, 96-98 per cent, 2 ozs.; boric acid, 2 ozs.; Epsom salts, 12 ozs.; acetic acid, ¼ oz. Temperature normal, voltage 3 to 4. To prepare the solution mix all the salts together, dissolve in boiling water, using as little as possible for solution. Add to the required amount of cold water previously put in the plating tank (the acid last). Use cast nickel anodes.

After nickel plating, re-wash in water and strike in a silver strike solution composed of water, 1 gallon; sodium cyanide, 96-98 per cent, 8 ozs.; silver cyanide, ½ oz.; caustic potash, ¼ oz. Voltage, 6 to 8; anodes, hard steel. Several old files may be used as anodes. Use a strong current for about 10 seconds only. Remove and silver plate directly in the following silver solution or in any good solution of similar composition. Water, 1 gal.; sodium cyanide, 5 ozs.; silver cyanide, 3 ozs.: carbonate of potash, 1 oz.; sal-ammoniac, ⅓ oz. Anodes, fine sheet silver; voltage 1 to 2. You will have to determine the length of time the product will have to be plated which will depend upon the price obtained for finish. After silver plating, wash in cold water and oxidize in the following solution: Water, 1 gallon; polysulphide, 1 to 2 ozs.; ammonia water, 26°, ¼ oz. Temperature, 160°F. Immerse just until the silver plated surface turns black, same as your sample. If 1 oz. of polysulphide per gallon gives this result, use no more at any one time. After oxidizing, remove, wash the articles in cold and hot waters and dry out. The oxide, or rather sulphide, must be removed from the high lights of the articles to show the silver as in your sample, by scouring with slow running buff or tampico brush wheels. The scouring medium is powdered pumice stone mixed with water to a paste. After scouring the surface as may be required, wash the articles in cold and hot waters. Dry out and lacquer by dipping or spraying. Any of the lacquer firms advertising in THE METAL INDUSTRY can furnish the necessary lacquers.

In producing the casket hardware green before mentioned, the procedure is identical except that the polysulphide solution must be used **cold**. The color variation will start with a yellow and when immersed long enough, will result in a gray green tone. When this tone is produced, wash in cold water and medium hot water. Scour down as previously mentioned for the antique or silver gray finish.—C. H. PROCTOR.

Stripping White Gold

Q.—I have failed with all formulæ for stripping white gold. Can you send me one that will strip the white gold bright?

A.—We suggest that you try out the following formula as a strip for white gold: Water, 1 gallon; sodium cyanide, 12 ozs.; bicarbonate of potash, 6 ozs.; acetate of copper, 4 ozs.; carbonate of potash, 2 ozs.; phosphoric acid 75 per cent, ½ to 1 oz. Temperature 180° F. Reverse current at 6 to 8 volts; articles as anodes, cathodes to consist of sheet carbon or steel, or silver to be removed when not in use. The articles to be stripped must be moved to and from the cathode during the stripping operation for best results.—C. H. PROCTOR.

Plating Difficult Work

Methods of Plating Silver on Aluminum, and Copper on Gutta Percha or Plaster

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

Silver on Aluminum

Q.—Enclosed is a sample of aluminum die-casting. Kindly give us advice on following:

What would be the cheapest method of polishing of the article consistent with good commercial finish?

Can a steel ball tumbling barrel be used, providing a protection for cutting edge is made and parting line fins removed by hand operation?

What would be a fair price for polishing in quantity of 5,000?

Referring to the same sample but different problem:

How can this article be silver plated successfully?

What solution for cleaner should be used?

Can silver be deposited directly without striking with another metal? (The composition of casting is 93 aluminum with 7 copper and traces of other metals.)

What solution, current and time are best?

A.—We answer your several questions as follows:

Ball burnishing in mechanical ball burnishing barrels with steel balls and a lubricating medium consisting of water, 1 gallon; soap bark, ¾ to 1 oz. If ball burnishing can be used, then one dollar per thousand should cover expenses of labor and power. This is a minimum cost.

The cost of hand polishing after the parting lines have been removed by emery polishing or scraping with a steel tool, would be about ten dollars per thousand. It would require a cutting down and color buffing operation.

Silver plating can be successfully done on the article. Aluminum, however, is difficult to plate.

The articles would have to be polished, then cleansed in hot alkaline cleaner for a few moments.

Immerse in an acid dip consisting of nitric acid, 2 gallons; sulphuric acid, 1 gallon; chloride of iron, 3 to 6 ozs. After immersing the articles in the acid dip, wash quickly in cold water and plate direct in a regular nickel solution until uniformly coated. After nickel plating, the articles would have to be flashed in a silver strike solution, at 6 volts, of water, 1 gallon; sodium cyanide, 96-98 per cent, 8 ozs.; silver cyanide, ⅓ oz.; caustic potash, ½ oz. Anodes of hard sheet steel, old steel files will answer. Plate only for a moment or two in this solution. Follow up the strike deposit with a regular silver deposit, from a normal silver solution, prepared as follows: water, 1 gallon; sodium cyanide, 96-98 per cent, 4 to 5 ozs.; silver cyanide, 3 ozs.; potassium carbonate, 2 ozs. Arrange to have the cathode or work pole mechanically moved to and fro, two to three inches towards the anodes. Anodes to be of fine silver. Voltage 1 to 2. Time of plating, 20 minutes minimum.

Copper on Non-Metallics

Q.—I am using a solution as follows: water, 1 gallon; copper sulphate, 2 lbs.; sulphric acid C. P., 3 ozs. weight; aluminum sulphite, 2 ozs. This makes a good deposit with E.M.F. up to 2½ or 3 volts, but is very thin on deep parts of mold. This deposit becomes very coarse and branch on the high parts of mold if current is increased to 5 or 6 volts.

I have been using this as a small solution and plan to make a large one. Can you suggest a more suitable one, and more rapid for deep work to finish about 1/16 in. thick, more or less. I have available E.M.F. up to 12 volts. Kindly suggest most suitable voltage and amperage for rapid work.

Where can I procure suitable gutta percha?

What is the most approved method for taking molds from plaster of Paris objects, also from metal objects having undercuts?

What is a practical method for taking a mold from a plaster figure about 12 in. high and 1 in. deep?

Is there any method by which molds can be taken with wax or gutta percha, or other such substance in molten or liquid state which would set so as to be separable from the original?

How can I render such molds conductive?

How can I make permanent molds to be used over and over for objects such as the plaster figure mentioned?

A.—To produce a more satisfactory copper deposit from the copper sulphate solution you mention (which is an unusually good one), it may be necessary to increase the sulphuric acid up to 8 to 10 ozs. per gallon. The solution should be agitated with compressed air or the cathode or work pole should be moved with both a horizontal and vertical motion about 4 times per minute.

Articles that have deep depressions should be entirely surrounded with sheet copper anodes made circular in shape. The distance from the object to be plated to the anode not more than 6 inches. The voltage does not need to be more than 1 to 2 volts. Carry all the amperage you can without burning the copper deposit.

For gutta percha we suggest that you get in touch with such firms as the Empire Notion Company, 72 Madison Avenue, New York. The firm manufactures gutta percha tissue. The crude material will be necessary or a material that becomes plastic in hot water.

Mold making is an expert trade, especially the production of undercut molds. Henley's Receipts and Processes, which can be found in any public library, contains considerable data covering mold making, etc. Or you might get in touch with firms specializing in this work, have one mold made and you can then use it for a basic patern for other molds. Ordinary two-piece molds for plaster casting can be made to protect the mold from the absorption of moisture. The inside of the mold should be uniformly coated, with two or more coats of orange shellac cut in denatured alcohol.

Wax or gutta percha could be cast in the liquid form in such molds. Metal molds, however, are most often used for gutta percha. The coating of the inside of the mold with the finest of jewelers' gold rouge mixed with water and a very little silicate of soda, acts as a parting to prevent gutta percha sticking. The mold should be heated to 200° or 300° F. before applying the rouge with a soft brush; permanent molds of bronze.

The most satisfactory conducting factor for non-conducting surfaces is copper bronze powder mixed with a celluloid lacquer medium and sprayed on the mold.

Corrosion Resistance of Chromium Plated Steel

Comparative Tests With Deposits of Other Metals and Composite Deposits

By A. E. OLLARD

The chief properties that make chromium of interest are its hardness and its resistance to corrosion from the atmosphere and certain acids. It is, however, readily attacked by hydrochloric acid, and is also easily corroded when it forms the anode of an electrolytic circuit.

CHIEF DIFFICULTIES IN ELECTRO-DEPOSITING CHROMIUM

A good deal of technical difficulty was experienced in the early attempts to electro-plate chromium on to other metals. Chromium forms several oxides, and metals of this type are always difficult to deal with, as there is a tendency to deposit one of the lower oxides instead of the metal. Electrolysis of chromium salts, such as sulphates and chlorides, do not give very satisfactory results, and most of the work on chromium plating has been done with a chromic acid solution. From this solution, fairly satisfactory deposits have been obtained in the laboratory, but it has been difficult to apply the process commercially. It is only within the last few years that processes have been evolved which have been satisfactory on a commercial scale.

The test pieces and other objects mentioned in the paper were plated by Dr. Liebreich's process, which is being used commercially in Germany and France. This process appears to give quite satisfactory results.

From time to time, investigators who have succeeded in depositing chromium have claimed various properties for the material they have treated. Among these claims the most noteworthy is that chromium plated directly on to steel will prevent it from rusting. It is perhaps unfortunate that such claims should be made, as, not infrequently, when it is found that they are not justified, the whole process is put on one side as being useless, whereas it may have many other important applications.

THE LABORATORY TESTS

In the laboratory tests, a number of steel test pieces, 2¼ ins. long by 1 in. wide and ⅛ in. thick, were cut from a bright steel strip, and a hole bored in one end to suspend them. These test pieces were then plated in groups of nine with different metals or combinations of metals. Of these groups, three were exposed to atmospheric corrosion, three were placed in a boiler and exposed to the action of steam, and two were placed in salt spray, while the remaining one was heated in the presence of air.

While chromium will not protect steel from rusting when plated on it directly, it was thought probable that if an underlying metal such as nickel or copper were first plated on the steel it might be possible to prevent it from rusting, and at the same time obtain the advantageous properties of the chromium plating. Groups of test pieces were therefore plated with one or more coatings of different metals before chromium coating, and tested as already described.

The difficulty of testing pieces of this nature lies in the fact that if the outer plating has been removed in any part, the rate of corrosion is materially changed, and usually very much accelerated. Test pieces of this nature show three types of failure. In the first case the coatings are gradually and fairly evenly removed until finally the base metal is exposed, after which corrosion takes place very rapidly; in the second, the plating is originally either pitted, or somewhat porous and corrosion takes place at a few local spots; while in the third case the plating is thrown off from the metal underneath it, either because it does not adhere or because the underlying metal is corroded through the pores of the outer one.

EXPOSURE TO "INDUSTRIAL" ATMOSPHERE

In the roof test the specimens were hung from a frame on the roof of the laboratory of the Metropolitan Vickers Electrical Company, Ltd., suspended directly above a trough of water and exposed to the Trafford Park atmosphere. The time allowed for the test was 768 hours, and examinations were made at intervals. Under these conditions the nickel-plated specimens were readily attacked and showed a greenish deposit on the surface. A cadmium specimen stood fairly well, but appeared to be evenly attacked. A copper specimen was very much tarnished, and lost a good deal of weight. In the case of the chromium deposited directly on to steel, the chromium plating was almost entirely removed, having apparently been thrown off by the corrosion of the steel underneath it. The chromium deposits, however, which were made on copper and nickel stood quite satisfactorily, with only slight traces of local rusting. In the case of chromium deposited on cadmium, this specimen stood remarkably well, but in some places the chromium flaked away from the cadmium coating. The chromium plating does not appear to adhere well to the cadmium, and, especially in the subsequent tests which involved temperature rise, the chromium plating was almost entirely removed from the cadmium.

The most satisfactory specimen from the point of view of loss in weight was that in which the steel was first copper and then chromium plated, although those with nickel at an underlying metal also stood very well. The use of copper as an underlying metal to nickel is quite a common process commercially, and steel articles to be nickel-plated are often first treated in the copper cyanide bath.

STEAM TESTS

Specimens were also suspended in the steam space of a small boiler. This boiler was arranged so that the steam generated by it was passed through a condenser and the water fed back again. Small additions of hydrogen peroxide were made at intervals to keep up the dissolved oxygen content of the water, and the conditions generally arranged to correspond with those which would be met in steam plant.

In this case, the chromium with underlying nickel proved the most satisfactory, while the nickel plating stood fairly well. Cadmium protected the steel fairly satisfactorily from rust, but lost weight and would have been removed in time.

SALT SPRAY TESTS

As chromium is attacked very violently by hydrochloric acid, it was thought that the conditions prevailing in the salt spray would corrode it very rapidly. It was found, however, that the salt spray had very much less action on the chromium plating than was anticipated, and it is thought that probably a definite pH value of the solution is required before the chromium is readily attacked. The pH value of the solution used in the salt spray was about 6.4, being slightly on the acid side. It is thought probable that this is slightly more acid than sea water, and it is proposed to make tests with sea water and also by exposing the test piece to marine conditions.

The specimens were sprayed for 122 hours (actual

spraying), being examined at intervals, and allowed to remain in the chamber at night while the spray was not working. The most satisfactory platings were those of nickel and cadmium. The chromium plating with nickel as an underlying metal stood quite satisfactorily, losing about the same weight as the nickel-plated specimens and less than the cadmium-plated specimens. The copper-plated specimen was very badly corroded.

HIGH TEMPERATURE TESTS

In the heat test, one specimen of each group was heated intermittently in an oven at about 400 to 420 deg. C. for 150 hours of actual heating. In this case, again, the cadmium plated samples were badly attacked, and so were also the chromium plated on cadmium. In the latter case the chromium was almost entirely thrown off. Other chromium plated samples seemed to stand fairly well, the surface of the plating, however, oxidizing slightly. The nickel plated specimen also stood well.

A COMPLEX PLATE

Another test piece of steel was made which was plated first with nickel for about an hour, then an hour in the copper sulphate bath, then replated with nickel for half an hour, polished, and finally chromium plated for half an hour. This was exposed on a roof for about two months, at the end of which time it was still quite bright, showing no apparent sign of rusting.

CHROMIUM PLATED SPOONS AND WINDSCREEN IN USE

In addition to the laboratory tests, a number of articles were chromium plated and put into service under different conditions. Sufficient time has not elapsed to enable many of the results to be given, but some are worth mentioning. Two spoons and a fork made of nickel silver were chromium plated and used for a period of about three months in a kitchen where they were subjected to fairly hard use. These have remained bright without any cleaning, and the plating does not appear to be affected. The color of the chromium plating being rather dark, it seems doubtful whether it would be satisfactory for table use, except perhaps in restaurants and places where its non-tarnishable properties would outweigh its slightly darker color.

The bracket holding the wind-screen mirror on a car was also plated, and this has kept bright much better than the nickel plating on the rest of the car. No polish has had to be used.

FOR DIE-CASTING MOLDS

Another important application for chromium plating has been in the protection of die-casting molds. In accordance with a suggestion by the British Non-ferrous Metals Research Association, a small steel pin from one of these molds was plated with chromium. These pins were originally made of ordinary steel, but it was found that they were very soon attacked, and comparatively few castings could be obtained from the molds before they had to be removed. They are now made of a rather expensive special steel, and it is hoped that an ordinary steel, chromium plated, can be substituted for this. The pin in question has made some 5,000 castings, and no difference in size can yet be detected with the micrometer.

OTHER TESTS OF ARTICLES IN USE

A chromium plated terminal was exposed in Sheffield for two months under conditions where a nickel plated terminal rapidly tarnished. At the end of the exposure the terminal was still bright, and as good as when first exposed.

Knives first nickel and then chromium plated were also put in service in a kitchen. These appear to be standing up quite satisfactory, and it is possible that for kitchen purposes, etc., such articles might replace rustless steel, although the plating will be removed at the end where the knife is sharpened.

GENERAL CONCLUSIONS

From the tests described, the author concludes that chromium plating is especially suitable in cases where an article is required to keep bright without cleaning. The chromium, being hard, takes a very high polish, and in this condition it appears to resist corrosion even better than in the unpolished state. Chromium, however, like nickel and many of the harder metals, is liable to be porous when deposited in thin coatings, and for this reason a single layer of such a coating does not form an efficient protection to an easily corrodible material such as steel. Chromium also, in spite of its position with regard to iron in the electro-chemical series, does not appear to protect it, due, perhaps, to its becoming passive, and, in this state, more electro-negative. The steel, therefore, is liable to be corroded through the pores of the plating, and will then throw it off, but this disadvantage can be almost entirely overcome.

The results of the tests seem to indicate that the most satisfactory plating for all-round purposes is the chromium plating made with nickel as an underlying metal. Steel plated first with cadmium and then with chromium appears to stand very well against atmospheric corrosion, but the chromium has a very strong tendency to strip from the cadmium. Also, chromium plated on cadmium will not take a high polish. Unless these difficulties can be overcome, therefore, it seems likely that cadmium will prove a satisfactory metal for underlying chromium.

While, therefore, chromium itself cannot be recommended for rust-proofing steel, steel articles plated first with nickel and then with chromium, especially if a layer of copper is put in between, will stand atmospheric corrosion extremely well. Some articles also will stand the action of steam and resist abrasion better than other platings, and may, therefore, prove extremely useful in steam plants. The chromium seems to adhere to the nickel quite satisfactorily.

Composite platings of this nature may be objected to commercially on the grounds of cost. It should, however, be pointed out that one of the chief costs of plating an article lies in the preparation, *i.e.*, in the setting-up, cleaning, and pickling processes. In the case of plating a specimen with a series of different metals, it is usually only necessary to swill the specimen and transfer it to the next bath, and therefore, the cost of the operation is not increased as much as might be expected. Also, the time required for each plating may be cut down to some extent.

SUITABLE APPLICATION

It seems probable that certain important applications will be found for this process in industrial practice. The test made on the die casting pin seemed to show that the process may have a big future in that industry, and it is by no means unlikely that platings of this description may find applications in chemical plant, etc. Chromium plating resists nitric acid very satisfactorily, and also most organic acids.

The polished plating will also prove of great use for domestic purposes. For motor car parts and especially for lamp reflectors it would appear to have a wide field of use, and if the tests with sea air prove satisfactory, it may be used largely for ship fittings, lighthouses, etc.

The tests described are merely preliminary, and it is hoped to continue tests on a more extensive scale, both in the laboratory and in service.

DISCUSSION

Mr. Macnaughton (Research Department, Woolwich) said that the author described it as unfortunate that claims should have been made that "chromium plated directly on to steel will prevent it rusting." Yet one of the investigators who make this claim is Dr. Liebreich, the inventor of the actual process of chromium deposition employed by Mr. Ollard. In a recent paper ("Electro Plating With Chromium," (Zeit. für Metallkunde), May, 1924), D. Liebreich says, "In ordinary water chromium plated sheets of iron were found to be entirely free from rust, while nickelled plates showed patches of rust where the nickel had loosened from the iron in places." He then proceeds to recommend chromium plating as eminently suitable for materials exposed to wind and weather.

DIFFERENT PROCESS AT WOOLWICH GIVES BETTER RESULTS

Mr. Ollard's own tests appear to contradict these statements. Thus his roof trial of chromium plated steel showed complete removal of the deposit at the end of eleven days. At Woolwich, however, using a different process developed there, chromium coated steel exposed to weather for over two months now has proved very satisfactory, only a slight discoloration having occurred. This and other tests in progress suggest that Mr. Ollard's results should not be taken as final, said Mr. Macnaughton, adding that it is hoped to publish the results of the investigations at Woolwich later.

In order to obtain a coating on steel which will satisfactorily resist the action of sea water, Mr. Macnaughton was inclined to agree with Mr. Ollard that a composite coating will prove necessary, but while the author has tested composite coatings upon steel of chromium with nickel, copper, and cadmium, he did not indicate the thickness of the coatings used.

In the salt spray tests Mr. Ollard had found that the copper chromium coating behaved badly, and that in the other cases corrosion occurred (in the form of blistering, flaking, or pitting) after 122 hours. At Woolwich a sample of steel first coated with zinc and then with chromium 1/1000 in. thick, after 230 hours in the salt spray test, has showed no signs of corrosion. This trial is still in progress.

HARDNESS OF DEPOSITS

An important advantage of chromium as a protective coating is its great hardness, which minimizes the risk of the coating being abraded through locally, with a resulting breakdown in the protection. The author had been unable to obtain hardness tests as his deposits were not thick enough. At Woolwich they had obtained deposits up to ⅛-in. thick. Of these, very bright deposits which could not be touched by a file were found to have a hardness greater than Brinell Number 700, whereas dull grey deposits which could just be touched by a file were found to have a hardness of about Brinell Number 600.

With reference to the application of chromium deposits to the coating of die casting molds, this was tried out at Woolwich some months ago with satisfactory results, which were reported to the Department of Scientific and Industrial Research.

HEAT TREATMENT OF DEPOSIT

Dr. R. S. Hutton (Director, Non-Ferrous Metals Research Association) asked if the author had considered the possibility of "welding" such a coating on to the steel in some form, or applying something in the nature of a case hardening process to it? It appeared that if steel plated with chromium was heated in non-oxidizing conditions, not only would the film become adherent, but it might partially, at any rate, alloy with the basis steel.

Plating of Soda Fountain Fittings

Silver Plating, Nickel Silver, Bronze, Brass, Britannia Metal and Block Tin. From the Monthly Review.

By JOHN YOUNG
Foreman Plating Department, Fletcher Manufacturing Company, Ltd., Toronto, Canada

NICKEL SILVER DRAUGHT ARMS

The work first comes from the Polishing and Buffing Department in a fairly clean state and is readily cleaned in one of the well-known cleaning solutions which removes any buffing compound, grease or other foreign matter. I then rinse the work in clean running water, after which it is placed in bran water, from which it is removed and scratch-brushed with No. O pumice stone. The work is then rinsed and sponged in clean running water and passed through the silver strike. From the strike it is taken and again scratch-brushed, then run through the silver strike a second time, after which it is placed in the regular silver-plating bath for one hour. I then remove it and scratch brush it again and return it to the regular silver-plating bath, in which it remains continuously for four hours longer—making a total of five hours deposit. After this the work is ready for burnishing and rouge buffing.

SYRUP PUMPS MADE OF NICKEL SILVER, BRONZE AND BLOCK TIN

These articles require a good deposit in the recesses as well as on the high parts. It is therefore necessary that the silverplating solution contain a higher percentage of free cyanide to improve the throwing properties of the bath, the method of preparing and treating the work being the same as mentioned in the previous paragraph.

SUNDAE CUPS

These are made of nickel silver and are heavily silver plated, being finished in the aforementioned manner.

SODA HOLDERS

These are made of britannia metal and after buffing are passed through the cleaning process previously mentioned; then through the silver strike and finally given a good deposit in the regular silver plating bath.

DISHERS

These are made of brass and nickel plated, and after being treated to the same cleaning process are put in the nickel bath and given a heavy deposit of nickel, then buffed to a bright finish.

The silver strike is the ordinary strike—low in metal and rich in cyanide.

The silver bath contains approximately 3 ounces metallic silver and approximately 4 ounces free cyanide to a gallon. In the silver bath for plating deep recesses the metallic content is approximately 3 ounces per gallon and the free cyanide approximately 6 ounces per gallon.

Spotting Out

Written for the 13th Annual Convention of the American Platers' Society at Montreal, Canada*

By R. M. GOODSELL

Spotting out of deposits of metal from cyanide solutions is a very common occurrence and possibly always will be as long as plating is done in cyanide solutions. It is not the object of the writer to tell you that it can be stopped, but if the suggestions offered are carried out it can be eliminated to a great extent.

Spotting out is a brown spot that appears on deposits of brass, copper and bronze at different periods of time after drying. Sometimes these spots appear immediately after plating and often appear as long as three or four months after the articles have been buffed, lacquered and shipped to the customer.

Spotting out occurs more frequently on porous metals, such as cast iron, cast bronze and steel that is known as pickled stock, which has been electroplated in cyanide solutions, although it also occurs on cold rolled steel, or any metal that has a finer grain structure.

Spotting out usually appears on articles that are heavily plated, although beautiful specimens have been obtained on articles that have only a light deposit of metal.

Some articles were plated, put in stock for a month and then packed in cases, which were in perfect condition when they left the factory. This shipment was about two weeks in transit, exposed to various temperatures, and upon arrival was opened. The articles were found covered with brown spots and rust in the center of these spots. After the return of the shipment this matter was taken up with several parties that were considered experts on plating, with the result that we were more confused as to the cause than before. The writer as a last resort then wrote a letter to Dr. Watts of the University of Wisconsin, sending samples of work and the different methods of procedure. Below is an excerpt of Dr. Watt's letter which I quote. The result was that the difficulty was overcome:

"The samples arrived O. K., and an examination confirms my previous opinion that some pieces of it are unfit to plate. On both the ball burnished samples I find a dozen or more deep cavities, the bottoms of which were not touched by the balls, while the edges of the deeper ones were "peaned" over to make the cavity bottle-shape. The rough, unburnished bottom and sides of these pits hold tenaciously whatever solution touches them. The trouble in plating such metal is threefold:

"1st. Within the pit the plating is much thinner than outside, or may even not cover the underlying metal.

"2nd. Removal of the plating solution by rinsing is likely to be imperfect.

"3rd. The lacquering is likely to be imperfect in the pits because the lacquer is diluted by plating solution or rinse water.

"If you cannot reject all metal having these deep and narrow pits, the remedy is to improve conditions in each of the three respects noted above. Give a longer plate, rinse more thoroughly, and the last rinse in *clean* water. If the lacquering is by dipping (I do not know how you apply water lacquer, but suppose it is by dipping), repeat the dip enough times to insure that the lacquer reaches the bottom of the pits in its full concentration, not diluted by water left in the pits from rinsing.

"Salt would, as you suggest, cause corrosion, but I do not think it did so in this case, for you will note that corrosion was confined to the pits and close to them, as if some chemical had oozed out of the pits. As the articles were dry when shipped, corrosion would not start until moisture had condensed on them, or been absorbed from the air by chemicals retained in the pits. This would occur when the shipment was brought from the cold into a warm room.

"Ten seconds immersion in an electric cleaner, dilute and containing no caustic, only soda ash and trisodium phosphate, would be a great help in removing the plating solution after the articles are plated. If you still have trouble after trying the other remedies, you had better try this. The hydrogen evolved in the pits helps to drive out the solution held in them, but of course leaves the pits filled with the cleaning solution. Caustic is especially hard to rinse off of metal surfaces, so had better be left out of the cleaner if you have to use one for this purpose.

"Occasionally examine samples before and after plating with a strong magnifying glass (the smaller the diameter of the blass, the higher its power); this will give warning of lots of work that require special treatment."

One of the most important factors to prevent spotting out on bright brass plating when water dip lacquer is used, is the quality of lacquer used.

It is absolutely necessary that the lacquer has a precipitating medium that will throw all water and moisture out of cavities and deep recesses and at the same time seal up these cavities and recesses, thus preventing any moisture of any kind from getting to, or, coming out of the article plated. Hot water opens the pores of the metal; cold lacquer seals them.

SUMMARY

Keep plenty of free cyanide in solution.

Rinse work thoroughly and be sure that water is kept free from cyanide or soda.

When using water dip lacquer, keep hot water free from impurities

Be sure your lacquer is kept cold.

On work that is heavily plated, dry thoroughly by aid of heat, if possible.

* From The Monthly Review, August, 1925.

White Gold Plating

Q. Will you kindly send me a formula for white gold plating?

A. Commercial white gold consists of an alloy of gold, nickel and zinc. These metals cannot be deposited out of a cyanide solution as a complete alloy. Therefore, the next best factors are gold and cadmium.

Prepare a gold solution as follows:

Water	1 gallon
Sodium cyanide 96-98%	2 ozs.
Sodium gold cyanide	½ oz.
Cadmium oxide	¼ oz.
Caustic potash	¼ oz.

Anodes 14 or 18 K. white gold. Temperature of solution 80° F. The cadmium regulates the color of the white gold; a very little silver is permissible or nickel in the form of the cyanides of these metals. Care should be taken not to add too much silver, otherwise the silver will predominate in the deposit. Nickel deposits very sparingly from a cyanide solution so a slight excess does no harm.—C. H. PROCTOR.

The Plating Supply Salesman

The Mutual Obligation Between the Plating Supply Salesman and the Manufacturer

Written for The Metal Industry by PETER W. BLAIR

There are two important things to remember about salesmen in the plating industries. One is that a good salesman is a storehouse of experience. The other is that salesmen are paid for their time and the business they turn in. But most of us disregard these considerations.

As a group, salesmen are a great potential force, and if used intelligently, could effect great changes in the industry. Unfortunately, they are not understood or appreciated sufficiently.

Too many of us superficially regard a salesman's job as that of getting orders for his firm. Closer analysis would show that the real work of getting business for his firm is a matter quite different from merely getting orders, **because it entails the obligation to reduce costs for the plating industry.** How well the salesman discharges his obligation measures his value to his firm and the plating industry at large.

By experience the salesman knows your buying methods and the buying methods of hundreds of others in your industry. He knows selling methods and policies. He knows his own goods and the goods of his competitors. By his contacts he knows business conditions; when business is good, when it is bad and what the business outlook is. He knows much about human nature, a good part of his knowledge having been driven into him by the hard knocks of experience.

How often one witnesses, and salesmen experience, the blunt and unpleasant attitude of a purchasing agent or plater who is always too busy, too impatient or too much a "Joe Hyde" to give the salesman an opportunity of demonstrating what he can and would like to do. Any manufacturer or plater who assumes that attitude loses by it. Yet it may not be his fault. Many supply houses send out salesmen who firmly believe that their one and only purpose is to get orders. Possibly they have had that idea ground into them by the home office. Started wrong, it is not surprising that the salesman's methods and selling talk produces on the average proprietor of a plating shop, a result similar to that of a dull needle working on a phonograph record.

Yet there are hundreds of plating supply salesmen who know what their job is and who go about it in a way that merits courtesy and confidence—often withheld. And the fact remains that these men are a tremendous power for good in the industry.

A simply but very effective policy with regard to salesmen is needed. Service of the highest type to his customers is the goal of every progressive head of a plating plant which holds its customers by doing work satisfactorily. Salesmen can and should aid platers to improve this service. Real salesmen do. Hence the policy of the plater need only be that of picking out the salesman who can and does consistently help him to give better service. There is the one with whom he should place his orders.

Good buying is a cold-blooded business function. It is not, as too many think, the habit or practice of driving sharp bargains. One of the best and most successful purchasing agents I have ever known has the art of brushing away all clouds of antagonism and suspicion between himself and salesmen who visit him. This permits him to establish an open and honest friendship with salesmen on the plane of minimum fair price, without haggling, and to get this price. As a direct result of this policy, this buyer gave me instances in which he had paid the right price, higher than that quoted by salesman because the salesman had quoted him a price that was too low. He told me of another instance in which the salesman had asked him to hold his order because the price which he was authorized to quote was not as low as it should be. That is team work. It is an example of good buying and good selling. Sentiment played no part in it; only the respect for the buyer's fairness which inspired the salesman to do his utmost to merit his confidence. In every case he got the quality he wanted at the best price.

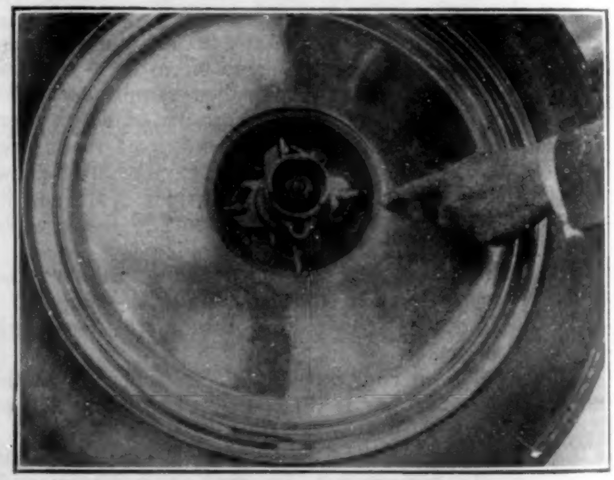
Every price has its reason. A particularly low price which cannot be explained by a good business reason is only a prelude to trouble on some future purchase. An unreasonably low price is usually a bait in the hands of an unscrupulous salesman. It should always serve as a warning.

Salesmen of plating supplies should join in honest straightforward team work with manufacturers and platers; team work that helps their combined endeavors to give their customers better service at a price that will pay both the salesman and the purchaser.

New Aluminum Wheel

A new type of automobile wheel has been perfected by an Oakland, California inventor which incorporates many new features. The wheel is made in both the disc and spoke types, both types incorporating the same features that make it different from other wheels.

The more important features of the new wheel are it



NEW ALUMINUM WHEEL

is made of aluminum alloy; safety from theft due to the locking system; silent; non-collapsible and dissipation of tire heat. The wheel is cast in aluminum alloy to gain strength and light weight. The spokes are drilled out to accommodate the locking lugs which tightly hold the rim and tire in perfect alignment. The wheel is put on and taken off easily and can be locked on with a theft proof lock.—C. W. GEIGER.

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

Member of Audit Bureau of Circulations and The Associated Business Papers

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EDITORIAL

INCREASING OUTLETS FOR METALS

By a number of authorities this has been called the Age of Alloys, and it is unquestionably true that never before have mixed metals been so widely recognized and popular. The complexity of modern industry, the demands made upon engineering materials, both physically and chemically, and the constant search for new products to manufacture, have stimulated the search for materials of all kinds to stand up under the severe conditions imposed upon them.

Metals are peculiarly suited to severe requirements. Although steel is cheap and dependable it is anything but lasting. Alloyed steels are a considerable improvement, but the really resistant alloyed steels are very expensive, as for example stainless or high chromium steels, and high speed steels. Alloyed metals, brass, bronze, aluminum alloys and soft metal alloys, are often little more expensive than the base material and have such unusual properties that they fit into many places where steels cannot go. For very highly chemically resistant purposes, combined with high strength, we have the nickel alloys which are rapidly coming into their own in spite of their comparatively high cost.

Brass, one of the oldest known alloys, and at the same time, one of the cheapest, is still finding new uses. The radio industry has opened a tremendous field. Every day one hears of new places where brass is used. Some of them are interesting, some have large possibilities, while others are merely amusing. Under the last named head, we have as an example the brass disc used by an amateur scientist and psychologist in Mexico, for charting the personality of a subject in the same way that an Ouija board is operated. While we mention such uses with a smile, it is nevertheless, an indicator of the way in which brass is viewed. The first impulse of the experimenter is to use the cheapest material possible. As soon as he finds that this will not do his work, he turns to brass. As a result, the number of articles, processes and machines in which brass plays an indispensable part mounts into the thousands. Phonograph records are being made by Professor Doegen of Berlin to preserve speech and songs for future ages. The life of one of his master records of brass is stated to be 10,000 years. A machine developed by the U. S. Coast and Geodetic Survey to forecast tides is made of brass. As a matter of fact it is called the "mechanical prophet with a brass brain."

All through industry we will find articles which, although they may not have brass brains, have brass hands or feet or other parts. We believe that no small part of the recent increase in the construction of copper and brass is due to these new outlets, small perhaps individually, but large in the aggregate.

METAL MANUFACTURERS IN 1923

The recently issued Census of Manufactures covering Brass, Bronze and Other Non-Ferrous Alloys in 1923, shows clearly, in statistical form, the steady progress of these industries since the depression of 1921. The Department of Commerce describes this industry as the manufacture of brass, bronze and other non-ferrous alloys, and of various products for manufactured and finished products made of these alloys, and of copper. It does not include the smelting and refining of copper, manufacture of bells, gas and electric fixtures, hardware, plumbers' supplies, etc., or establishments engaged primarily in the production of such commodities. These industries are covered by name under other special bulletins. Hence this summary should not be taken as all-inclusive, but simply as indicative.

In these two years, from 1921 to 1923, the number of establishments engaged in this industry rose from 911 to 1035, or 13.6 per cent. Persons engaged rose from 46,712 to 73,987 or 58 per cent; salaries and wages 77.6 per cent; cost of materials rose 154 per cent; value of products rose 138 per cent and the value added by manufacture rose to 113 per cent.

An analysis of these figures will show that the industry increased in size, employed more people, paid them better, paid more for its raw materials, and got more for its products, but not in proportion to the increased costs involved. In other words, the plants became busier but profits were probably not in proportion to the volume of business done. This verifies the generally expressed opinion at that time that while the wheels were turning over they were not making money.

Another interesting fact about this industry is that a small number of plants, 82, or less than 8 per cent of the total number, employed 69 per cent of the total wage earners and turned out 77 per cent of the total production. These 82 concerns are rated as having made metal products to the value of $1,000,000 and over. The rest of the firms engaged in this industry ranged down to $5,000 and less, numbering 1053, split the 23 per cent of the business between them.

The total value of products turned out was about $511,000,000. Ingots and bars amounted to about $26,500,000; plates and sheets $113,500,000; rods $60,000,000; tubing (seamless) $33,000,000 (brazed $4,500,000); wire (plain), $48,500,000; wire (insulated including cable), $11,000,000, and castings, rough and finished, $72,000,000 and $37,500,000 respectively.

The location of the industry will be interesting to analyze. In ingots and bars, Pennsylvania leads by a wide margin with Illinois, and Connecticut third, except for brass in which Illinois leads with Pennsylvania second. In plates and sheets Connecticut leads all other states in brass, bronze and aluminum, but not in copper. In rods Connecticut leads with Michigan second. In tubing Connecticut leads with New York second in some items and Michigan in others. In brazed tubing, Connecticut leads all other states; in wire Connecticut leads all other states again. In rough castings, the figures are so diversified as to make general conclusions difficult. Illinois leads in brass; Pennsylvania in bronze and copper and Ohio in aluminum and other alloys, with Connecticut far behind in all these. In finished castings, Illinois leads in brass; Pennsylvania in bronze and copper and Ohio in aluminum and other metals.

As regards the combined figures for the industry as a whole, Connecticut still leads by a wide margin in all departments, such as coal consumed, salaries, wages, cost of materials, value of products and value added by manufacture. Everyone is watching curiously to see if the oft-predicted movement from Connecticut to the Middle West will take place, but so far, at least between 1921 and 1923, no conclusive move to this effect was made.

FOREIGN MAKETS FOR COPPER AND BRASS

The Department of Commerce has issued special circular (No. 234, Parts 1 and 2), on the foreign markets for American copper and brass products. These reports cover the countries which purchase crude copper from the United States for manufacture and exportation to countries consuming finished coppr products. They are in order named, England, Austria, Germany, France, Canada, Belgium, Italy and Japan. Another report will be published later covering the countries which offer a potential market for finished American copper, brass and bronze products.

By far, the largest part of the copper exported from the United States goes out in the form of crude copper, while that of brass takes the form of scrap and secondary, suitable for re-manufacture. In Great Britain, until recent years, there were more than half a dozen independent firms in the Swansea District engaged in smelting and manufacturing copper, but now there are only three. Austria offers an active market although domestic production is increasing. It is also stated that many believe that the United States should be able to increase its sales of copper alloys and sheet copper in this market, providing the prices and terms of payment will meet competition.

Germany is normally the largest consumer of copper in Europe, in the form of ingots, bars, sheets and other semi-manufactured forms. At the present time she is regaining her position as the leading copper consuming country of Europe, although her advancement is very slow.

Imports of copper and copper products into France have increased considerably during the past few years. Examples of these are copper wire and scrap copper and brass.

Canada produces large quantities of copper in the form of ingots, bars, copper ore, etc., and buys back manufactured brass and bronze products, to a considerable extent, from the United States. The largest single item of copper goods is in the form of tubes to be used largely in the brewing and distilling industries.

Belgium produces no copper whatever, but is in control of the Katanga mines in Congo. She is one of the important customers of the United States for raw copper, but her imports of copper products are very low in comparison, plants in Belgium being very well equipped to do this work themselves.

Italy has very few copper mines and must, therefore, import metal for use in her electrical and mechanical industries. Although the United States furnishes the greater part of the crude and semi-manufactured copper products to Italy, Germany leads in selling her finished, fully manufactured goods. Italy's electrical industry, brewing and sugar refining take most of this metal.

Japan is now a great copper producer with the industry largely in the hands of individuals or families. Some of the larger companies operate plate rolling mills, wire factories, etc., or own subsidiary companies for manufacturing raw copper into finished goods. The mainstay of the copper consumption is the hydro-electric industry which takes about 80 per cent of all the copper consumed in Japan.

This Circular of the Department of Commerce will stimulate interest in foreign markets for copper and brass finished products by pointing out the leading possibilities for the sale of such products abroad.

GOLD MAKERS DISAGREE

Recently published reports of experiments to check the work of Dr. Miethe and Dr. Nagaoka in transmuting mercury into gold seem to indicate that the subject is anything but settled. A statement from the American Chemical Society reads as follows:

"Ehrich Tiede, Arthur Schleede and Frieda Goldschmidt, on repeating Miethe's work could in no case detect the formation of gold, and pronounces such formation, as in the accounts of Miethe and Stammreich, as at least difficult to reproduce.

"Likewise Professor E. H. Riesenfeld and his collaborator W. Haase, declare that, according to their experience, mercury is to be obtained practically free of gold only after many repeated slow vacuum distillations, and that all mercury preparations hitherto utilized for gold production contained gold.

"Moreover, according to Riesenfeld all mercury on the market contains gold."

Professor Sheldon of New York University, after working with the methods of Dr. Miethe in an investigation financed by the Scientific American declared that they had obtained no result and he believes that Dr. Miethe found gold because he used Spanish mercury which contains a small amount of gold.

On the other hand, there has been published a statement to the effect that Dr. Miethe was able to extract, in later experiments, 10,000 times as much gold as he obtained in his earlier experiments.

The merits of this controversy cannot be judged as yet, as it will require far more work to establish either one claim or another. What can be said at the present time, however, is that the project is still so far from commercial that gold miners, bankers and national treasuries need not fear a heavy influx of gold for many years to come.

PROHIBITION AND POLISHING

Prohibition has its advocates on many counts, as it has also its opponents. From a business point of view, so far as the metal industries are concerned, the question interests us little, if at all. In one way however, it has made a difference. In the old days sour beer was used in scratch brushing jewelry to give the finished product a brilliant lustre. According to a newspaper article, when prohibition eliminated this by-product, and near-bear was unsatisfactory (either for drinking or polishing), something had to be obtained quickly. It was, of course, as there is never any doubt of our ability to replace one product with another when necessity arises, and a solution of soap tree bark was used. This has been eminently satisfactory and now the polishing industry no longer mourns the passage of the Volstead Act, at least so far as polishing is concerned.

That such events can be exaggerated is shown by the importance attached to such an item in the daily press. We are told on good authority that stale beer was used thirty-five years ago as a lubricating factor in the lathe burnishing of metal articles. Occasionally the dealers in beer, who sold the stale beer for this purpose, would slip in a keg of good beer by mistake and the lathe burnishers would find a much better use for it than as a polishing medium, with the result that the day's output fell off sharply. The fact is however, that soap bark was known and used years before the Volstead Act, and that when this act was passed, it was an easy matter to switch over to this material entirely. Whatever prohibition has done to other industries, it has certainly had little or no effect on polishing.

New Books

Thomas' Register. Published by Thomas Publishing Company. Size 9 x 12, 4300 pages. Price, payable in advance, $15.00. For sale by THE METAL INDUSTRY.

The 1925 edition of this well known trade directory will be issued about October 1st. It embodies more than 250,000 changes since the last edition.

Mineral Resources of the United States in 1922. Part 1. Metals. By G. F. Loughlin, U. S. Geological Survey, Washing, D. C. Size 6 x 9, 648 pages. Price $1.00. For sale by the Superintendent of Documents, Government Printing Office, Washington, D. C.

Mineral Resources covers the sources of minerals in the United States, including all the metals. Data are given on the production, consumption, import, export, prices, market conditions, etc.

Chemical Engineering Catalog. Published by the Chemical Catalog Company.

This is the annual issue of a standard work of reference for those who buy and specify equipment and materials in the industries, using chemical processes. It is a compilation of catalog data standardized as to page, size and typographical arrangement and supplemented by a classified index of equipment, supplies and materials. It is published annually under the supervision of an official committee of the American Institute of Chemical Engineers, the American Chemical Society, and the Society of the Chemical Industry.

All lines of the chemical industry are included and, of course, among these lines, those using or producing metals play a large part. Engineering catalogs have become standard reference books in every technical library.

Iron-Steel-Metal Directory. Publishel by Atlas Publishing Company. 1600 pages. Price, payable in advance, $10.00. For sale by THE METAL INDUSTRY.

This is the fourth edition of a directory on the iron, steel and metal industry. In the general section are listed steel mills, blast furnaces, iron, brass and aluminum foundries, copper, lead, zinc, and other metal smelters and manufacturers, including names of officers, purchasing agents, sales managers and giving considerable information about the factories. In the classified section under the head of non-ferrous metal industries, are special lists of jobbers, dealers, importers and exporters; railroads and their purchasing agents; automobile manufacturers and street railways and their purchasing agents. A statistical section is also included giving production and consumption figures and price trends.

A Graduated Course in Strength and Elasticity of Materials. By E. P. Coston. Published by Scott, Greenwood & Son. two volumes. Size 4½ x 7¼. Volume 1, 264 pages; volume 2, 436 pages. Price, payable in advance, $4.25 per volume. For sale by THE METAL INDUSTRY.

This work is a text-book giving elementary and advanced training in figuring stresses and strains in materials of all kinds. It is largely mathematical in character, being meant for the student of engineering design and the designing engineer. It is, however, a valuable reference work for all those engaged in the testing and application of various materials, such as metals for engineering purpose. Among the subjects covered are: the various stresses and strains, such as shear bending, torsion and rotation; resilience; deflection, moments of inertia; unsymmetrical bending; springs; thick cylinders and spheres; hanging wires and chains; vibrations.

Chemistry in Modern Life. By S. A. Arrhenius and C. S. Leonard. Published by D. Van Nostrand Company. Size 6 x 8½, 286 pages. Price, payable in advance, $3.00. For sale by THE METAL INDUSTRY.

Chemistry of Modern Life is one of the Library of Modern Sciences. The author, Dr. Arrhenius, is internationally known as a chemist and the translater is on the staff of Yale University as a Research Fellow. The book is essentially cultural in character rather than technical or scientific. It begins with ancient ideas about the constitution of matter and deals with the fundamentals such as fire, tools and metals, constituents of the earth's crust, fossils, fuels, air and water; sources of energy and general chemistry. Some of these principles are carried through modern processes of manufacturing goods for general consumpton.

Works of this sort are always interesting to technical men and extremely useful in showing them the relation of their specialized and sometimes obscure problems to the general business of living. They help to lift their noses from the grindstone and broaden their outlook.

Labor Relations in Industry. By D. L. Hoopingarner. Published by A. W. Shaw Company. Size 5½ x 8½, 553 pages. Price, payable in advance, $6.00. For sale by THE METAL INDUSTRY.

The question of human relations in industry has received a great deal of attention in the last few years, stimulated by the increasing need for such attention. The subject is very difficult, complicated as it has been by years, and for that matter, ages of inadequate treatment.

This book, it is stated, approaches the subject from the standpoint of industry as a whole rather than that of the individual plant or organization. In other words, it is largely concerned with broad policies, and defines its specific purposes as follows:

1. To give a basis for developing a general point of view.
2. To analyze the major problems involved.
3. To indicate the major trend of development of policy and organization in various fields.
4. To offer constructive suggestions for handling administrative problems of this nature.

The book is really a general guide and reference work. It does not pretend to solve specific local problems, but is an aid to developing an understanding of the problem as a whole. Those interested in buildng up or maintaining a labor relations department in their plants, will be wise to study carefully the fundamental principles laid down.

1925 Tentative Standards of the American Society for Testing Materials. Published by the American Society for Testing Materials. Size 6 x 9, 876 pages. Price, payable in advance, $7.00 in paper and $8.00 in cloth.

This is the 1925 edition of the annual book issued by the society. It contains 194 tentative standards, of which 17 relate to non-ferrous metals, covering the following items: Phosphor Tin; Phosphor Copper; Silicon Copper; Aluminum Base Alloy Sand Castings; Bronze Trolley Wire; Soft Retangular Copper Wire; Hot-Rolled Copper Rods for Wire Drawing; Manganese-Bronze Ingots for Sand Castings; Manganese-Bronze Sand Castings; Muntz Metal Condenser Tube Plates; Non-Ferrous Alloys for Railway Equipment in Ingots, Castings and Finished Car and Tender Bearings; White Metal Bearing Alloys (known commercially as "Babbitt Metal"); Aluminum Ingots for Remelting; Aluminum Sheet; Aluminum for use in the Manufacture of Iron and Steel; Non-Ferrous Insect Screen Cloth; Chemical Analysis of Aluminum and Light Aluminum Alloys.

The term "Tentative Standard" as distinguished from "Standard" is applied to a proposed standard which is printed for one or more years with a view of eliciting criticism, of which the committee concerned will take due cognizance before recommending final action toward the adoption of such tentative standards by formal action of the society. The "Standards" and "Tentative Standards" of the American Society for Testing Materials are recognized as authoritative in the field of engineering materials.

GOVERNMENT PUBLICATIONS

Heavy Rust-Preventive Compound. Federal Specifications Board, Specification No. 239. Circular No. 200. Bureau of Standards, Washington, D. C.

Asbestos Metallic Cloth Gaskets. Federal Specifications Board, Specification No. 97a. Circular No. 242. Bureau of Standards, Washington, D. C.

Eaves Trough, Conductor Pipe, Conductor Elbows and Fittings. Simplified Practice Recommendation No. 29. Bureau of Standards, Washington, D. C.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { WILLIAM J. REARDON, Foundry; JESSE L. JONES, Metallurgical; PETER W. BLAIR, Mechanical. CHARLES H. PROCTOR, Plating-Chemical; WILLIAM J. PETTIS, Rolling Mill. R. E. SEARCH, Exchange-Research

BLACK NICKEL

Q.—How can I obtain a good dead black solution upon satin nickel work, to produce an old iron finish, to be used on builders' hardware? I have tried the sulpho cyanide black nickel solution, but find it too slow and expensive for the class of work. I also have trouble with this turning gray after it has been worked a few days. What can I do to remedy this gray effect?

A.—The following formula for black nickel solution should give you a good dead black finish on satin nickel articles. Water, 1 gallon; double nickel salts, 8 ozs.; sodium sulphocyanide, 2 ozs.; sulphate of zince, 1 oz. Dissolve copper carbonate in 26° aqua ammonia in sufficient quantities so that a clear blue solution results. Then add from 1 to 2 ozs. (fluid measure) per gallon of solution at ½ to 1 volt. You should obtain a dead black deposit suitable for your purpose.—C. H. P. Problem 3,446.

BRIGHT DIP FOR NICKEL SILVER

Q.—Under separate cover I am sending a nickel silver pan. I would like to know the best method to finish this part in a bright dip with edges buffed. I have tried the ordinary bright dip, but I think there must be a pickle of some sort to be used previous to bright dipping, as they leave the bright dip with a sort of smudge.

A.—German silver must be treated differently from copper, bronze or brass, to insure a bright acid dipped surface. The oxides that form on copper, bronze or brass when the metals are heated are readily reducible in warm sulphuric acid pickles, 10 to 15 per cent strength. German silver owing to its nickel content and nickel oxide on its surface, when heated or annealed, cannot be pickled successfully in such pickling solution. We suggest the following be tried out. Water, 1 gallon; sulphuric acid, 16 ozs.; bichromate of soda, 4 ozs.; common salt, 2 ozs. Heat the solution to 160° F., immerse the articles to be pickled in the solution for a few minutes until the oxide is reduced. Wash in water and immerse in a bright dip, prepared as follows: sulphuric acid 66°, 1 gallon; nitric acid, 38°, 1 quart; water, 1 pint. If this dip gives a bright finish, satisfactory for your purpose, prepare a larger solution. If the color is not bright enough, add nitric acid at intervals until it is. A little muriatic acid may be added to the dip to advantage, 1 to 2 ozs. per gallon.—C. H. P. Problem 3,447.

CADMIUM PLATING

Q.—Please send me some information about cadmium plating.

A.—Cadmium is one of the best rust resisting metals to deposit on steel to protect it against the corrosive action of brine solutions. Naturally, you will have to deposit a good substantial coating to give the maximum of protection. Under the 20 per cent salt solution corrosive test, cadmium is nearly 3 times more resistant than zinc. The following is a good solution. Water, 1 gallon; sodium cyanide, 96-98 per cent, 7 ozs.; cadmium oxide, 3 ozs.; caustic potash, 2 ozs.; oxide of mercury, 1/15 oz. Use cadmium anodes and a warm solution 80° to 100° F. Voltage 4 to 6. The oxide of mercury should be dissolved separately in ½-oz. of the cyanide and must be thoroughly mixed in the solution. As a brightening factor, if found necessary, add to the solution 1/32 oz. powdered glue and 1/32 oz. licorice powder. These materials should first be dissolved in a little boiling water before adding to the cadmium solution. A small amount of kerosene applied to the buff wheel when polishing cadmium with lime compositions, helps to eliminate the dragging and gives a cleaner finish. Use as little kerosene as possible for results.—C. H. P. Problem 3,448.

CLEANING OLD PEWTER

Q.—We have some old pewter ware which has been silver plated and has turned very black. Can you advise us of some method of stripping off this old silver and preparing the pewter ware for re-silver plating?

A.—To cleanse old pewter or Britannia ware for replating, prepare a solution consisting of : water, 1 gal.; caustic potash, 4 ozs.; bichromate of soda, 2 ozs. Temp. 180 to 200° F. Immerse the old pewter articles in the cleaner for a short time, then remove them; wash thoroughly in cold water, then scratch brush them **wet**, using a little bicarbonate of soda in the brushing water. The next operation is to scour the surface with a tampico brush and pumice stone, and water mixed to a fluid paste. After brushing, wash carefully in water, then silver strike the articles with a silver strike solution as given in Platers' Wrinkles, and finally silver plate as usual.

To strip off the old silver after cleansing, prepare a solution consisting of water, 1 gal.; sodium cyanide, 8 ozs. The articles from which the silver is to be removed, should be made the anodes. Then use sheet steel as cathode. The method is just the reverse to plating. A voltage of 4 to 6 should be used in the stripping operations. Finally re-brush with pumice stone as outlined and silver plate.—C. H. P. Problem 3,449.

DANGERS OF CYANIDES

Q.—I am working on an invention—metal line—and it appears that experiments in electro-plating may be an aid to success.

Is it dangerous for an amateur to use sodium cyanides in plating baths? I know potassium cyanide is deadly; have heard and read of men dying abruptly handling it.

On page 8 of *Platers' Wrinkles*, copper cyanide and sodium cyanide are mentioned in formula for copper solution, alkaline. Is the copper cyanide also deadly?

A.—Cyanides of sodium or potassium or copper cyanide are all deadly poisons when taken internally. Hundreds of tons of these materials are used every month, yet we never hear of a fatality, unless the user has deliberately committed suicide. Some platers prefer to handle the cyanides with hands protected with thin rubber gloves. This is a precaution. The writer has handled cyanides all his life with bare hands. It is advisable, however, after handling the material with bare hands, to wash them thoroughly, and as a neutralizing factor, to immerse the hands in a dilute acetic acid and water solution, vinegar, or dilute sulphuric or hydrochloric acid solution. If you follow these suggestions, no harm will result.—C. H. P. Problem 3,450.

EXCESS CADMIUM IN NICKEL SOLUTION

Q.—I have been having considerable trouble with my nickel solutions, plating black or a dull grey color. On page 4 of Platers' Wrinkles, I find that by using a cadmium stick as an anode it would produce a white deposit. Some time ago the plater I have working on the nickel solution forgot and left this cadmium anode in the nickel solution for two days. Now I find that the deposit is very bright and glossy and has a tendency to peel at the bottom of the racks. Would you kindly tell me how I can overcome this trouble and bring this solution back to normal again?

A.—An excess of cadmium in a nickel solution is even worse than an excess of arsenic in a cyanide brass solution. Both factors when in excess produce hard bright metal deposits. To overcome your present brittleness of the nickel deposit, due to an excess of cadmium in the deposit, make the following additions. Add to the solution ⅛ oz. per gallon of muriatic acid and note the results. If the brittle deposit has been overcome with the acid addition then make no further addition.

If the acid does not overcome the trouble, load up your cathode or work poles with sheet steel or scrap or cast iron, etc. Apply all the current you can and in a short time the excess of cadmium will be reduced to normal.—C. H. P. Problem 3,451.

HIGH SPEED BUSHINGS

Q.—I wish you would tell me if a mixture of 85 copper, 14 lead, and 1 tin, would stand up better than 80 copper, and 20 lead which is now being used for bushings in high speed tapping machines. Please give the formula that you think will be best suited for the purpose and how to proceed in melting 50 lb. for sample bushings. There is not much pressure on these bushings but the speed is about 1,800 r. p. m.

A.—The mixture we would suggest for this work would be 69 copper, 26 lead, 4 tin, ½ nickel and ½ antimony, made as follows. Make a hardener of 5 copper, 3 tin and 2 nickel. Pour into ingots and use as follows. Melt 67¾ copper, add 2½ hardener, ½ antimony, 26 lead and 3¼ tin. Add the lead a little at a time and stir well before pouring.

If you have any segregation change the mixture to 66½ copper, 5 hardener, 2½ tin, 26 lead and ½ antimony. If, however, you desire to use the mixture of 85 copper, 14 lead and 1 tin, you will find it more satisfactory than 80 copper and 20 lead.—W. J. R. Problem 3,452.

NICKEL PLATING

Q.—What would you consider the most efficient amount of nickel to carry in a moving cathode tank. At present I have about 4 ozs. of actual nickel per gallon, by that I mean about 20 ozs. of single nickel salts per gallon. Do you think that is enough for a 20 minute deposit in a moving cathode tank? It is on cold rolled steel parts which are buffed, after plating. What is the simplest method to determine how much amperage it takes to plate a square foot of surface?

I have considerable trouble with staining on my barrel plated work. I maintain the solutions slightly acid but still it seems the minute they hit the hot water rinse, they turn all colors. I am using cold water, whale oil soap and boiling water.

A.—For rapid nickel deposits in a moving cathode solution, 20 ozs. single nickel salts are hardly enough. Increase to 24 or 28 ozs. per gallon. If you replenish such solution with a combination consisting of water, 1 gallon; nickel sulphate, 1 lb.; nickel chloride, 4 ozs.; boric acid, 2 ozs.; temp. 160° F., you will be able to obtain rapid deposits at high amperages. The above is only a basic replenishing formula. You will have to use as many pounds as may be required for replenishing purposes.

Staining of nickel deposits: Change your acid replenishing to hydrofluoric acid to give the desired acidity. Add Epsom salts up to 12 ozs. per gallon. This addition will give you whiter nickel deposits. Use your soap solutions cold, then rinse off in boiling hot water.—C. H. P. Problem 3,453.

PLUMBERS' BRASS FERRULES

Q.—Can you give me a mixture of easy flowing material to make 4 x 4 x 2 x 4 plumbers' brass ferrules? I have been using scrap and I lose too many to make them pay. I can get a good trade on them If I can get a good mixture.

A.—The cheapest mixture you can use on this work is scrap brass of any sort and add about ¼ per cent aluminum. If, however, you wish to use a cheap new metal mixture, we suggest 58½ copper, 41¼ tin and ¼ aluminum.

You should find a cheap grade of scrap that would answer your purpose and add small amount of aluminum to aid the running. Keep the sand as dry as consistent for the proper lifting of patterns. The dryer the sand the better results you will obtain.—W. J. R. Problem 3,454.

REFINISHING BRASS CURTAIN POLES

Q.—Would like to get a good dull brass finish on new curtain pole rings, that are now polished and lacquered. What would you advise for the finish, and what to use; also brush and power, etc.?

A.—The best method for you to use in refinishing curtain pole rings made of brass, which are now in a polished finish, to a dull or brush brass finish is as follows. Remove the lacquer with wood alcohol, then dry out in sawdust or by heat. To produce the dull finish, brush down with pumice stone mixed with a little machine oil, then wash afterwards in gasoline; dry out in maplewood sawdust and relacquer. If you have an oblique tumbling barrel, you may be able to finish the rings by tumbling in sawdust moistened with water and pumice stone or in dry pumice stone and sawdust—or with pumice stone, sawdust and oil. One or the other methods should give you the desired results. A tampico brush wheel should be used if the rings are brushed by hand manipulation.

A wooden curtain pole covered with Canton flannel and then moistened with the pumice stone and oil mixture, would enable you to finish the rings on the inside, a dozen or more at a time, at the same time the outside is being finished with the revolving tampico wheel brush; the rings should be allowed to spin in the curtain pole. One or the other methods can be used to advantage.—C. H. P. Problem 3,455.

RUST-PROOFING GRAY IRON

Q.—What are the methods and formulae for black on polished gray iron; also blue finish on polished gray iron?

A.—There are two methods of producing a black and blue finish on polished gray iron. The first is known as the heat blue and consists of the following methods:

1. Polish and cleanse the gray iron, then pre-heat in a muffle to 400° F.
2. In a molten solution prepared of equal parts of sodium nitrate and sodium nitrite, in an iron pot of suitable dimensions, and heated to 700° F., immerse the pre-heated articles in the molten mixture until they become blue or black as may be desired, then remove, wash in cold and boiling hot waters and while still hot, wipe with a cloth moistened with linseed oil.

The second method consists of immersing the gray iron castings in a boiling solution consisting of water, 1 gal.; hydrogen acid, 3 ozs.; rusty iron filings, ⅜ oz.; ferric sulphate, ¼ oz. Use an iron tank heated with steam coils. Use plenty of coils to maintain a constant boiling temperature. Have a steel cover made for the tank with a few holes for the steam **to escape.**

To prepare the solution, dissolve the iron filings in the acid, first allowing 10 hours for solution, then add to the boiling water, mix thoroughly; add the **ferric** sulphate. Be careful; **do not use ferrous** sulphate. Boil the articles for one to three hours, then remove and drain thoroughly. Wipe down the surface with linseed oil using 2 parts oil to 1 part liquid Japan dryers. A rust proof black finish will result. To replenish the solution, dissolve from ¼ to ½ pound of iron filings in each pound of hydrogen acid as outlined. Maintain the original water line in the tank, then as may be required, add ⅛ to ¼ oz. of the acid and iron per gallon of solution, and occasionally ⅛ oz. of the ferric sulphate.—C. H. P. Problem 3,456.

SHEET BRASS HARDWARE CLEANING

Q.—We are manufacturing a new line of hardware which we finish in a butler silver. We brush this work before nickel plating with emery cake and oil on a tampico wheel, also after plating. We are experiencing some difficulty in cleaning this work.

I am using a prepared cleaner but it will not remove the grease thoroughly. Have tried brushing this work with dental pumice and water which is very satisfactory if the work can be cleaned as soon as it is finished in the polishing room, but if allowed to stand it stains in the filigree background and is hard to remove. We are enclosing sample for your inspection.

A.—It is our opinion that in order to produce the results you desire in the cleansing of your product, both before and after nickel plating of the sheet brass automobile hardware, to produce an imitation Butler silver finish, it will be necessary to cleanse the product in boiling solution of a neutral soap, such as whale oil soap, for the cleansing of highly polished brass products.

Use 4 ozs. per gallon of boiling water and maintain the solution at a low boil. Immerse the articles in the solution in iron wire baskets until all the polishing dirt is removed, then wash out in boiling hot water; recleanse in the soap solution if found necessary.

Another method that is used extensively in cleaning aluminum or die casting metal from buffing dirt is to arrange two solutions in alcohol barrels. The first to contain a soap solution as outlined consisting of 2 ozs. of soap per gallon of water, maintained

at a boil with steam coils. The second solution should consist of kerosene oil also heated to 212 deg. F. Immerse the articles to be cleansed from the buffing dirt, first in the soap solution for a few minutes, then drain thoroughly and immerse in the heated kerosene oil solution until the buff dirt is all removed. Drain thoroughly and reimmerse in the soap solution for a moment or two. Then remove, recleanse, and nickel plate or dry out from the soap solution.—C. H. P. Problem 3,457.

SILVER DIP

Q.—Will you kindly tell me the formula of a solution to silver plate brass and copper without electricity. The solution I saw deposited a nice coating of silver, almost immediately after being applied.

A.—The following formula will produce an immediate silver plated surface when applied to copper or brass, which must be clean and bright.

Chloride of silver, 1 oz.; hyposulphite of soda, 7 ozs.; finely powdered prepared chalk or whiting, 8 ozs. Dissolve the silver first in a few ozs. of water, then add the other materials in the order given. Now add as much water as required to produce a cream-like paste. Apply to the articles to be silvered, with a soft cloth.—C. H. P. Problem 3,458.

SILVER ON STEEL KNIVES

Q.—I am having some difficulty in trying to plate steel pie knives, etc. The cleaning process I am now using is as follows: 1. I dip them in boiling alkali, scour them and then dip them in muriatic acid. 2. I use two strikes in cyanide, one much stronger than the other. Then I put them in the plating tank. After they come from the plating tank, they seem to be very smooth and white but when buffed, the plate strips around the bolster and on the top edge of the blade, and sometimes they streak. The tip of the blade, however, seems to stay very firm.

A.—We presume you refer to silver plating as you mention the use of two strikes in plating steel blades of pie knives. The inference would be that your trouble is due to hydrogen, possibly resulting in the strike operations. Your cleansing must be satisfactory or the deposit would not adhere at any point of the blade.

It is difficult from a distance to determine the real cause of your trouble. However, we suggest the following. In strikes No. 1 and No. 2, add about ½ oz. per gallon of caustic potash. Strike No. 1 should deposit practically only a film. Use anodes of hard steel such as old files with just a very small silver anode.

The sodium cyanide can run up to 8 to 10 ozs. per gallon of water with ½ oz. or more of caustic potash. Strike No. 2 should consist of 8 ozs. sodium cyanide per gallon; ⅓ oz. silver cyanide; ½ oz. caustic potash. Use steel anodes in this solution with anode of silver just large enough to maintain the silver in solution to give a good strike deposit. The voltage should be as high as six on both strikes. To your regular solution, make an addition of 1 to 2 ozs. potassium carbonate and sufficient free cyanide to give a uniform deposit without streaks. During the regular plating operation, the work rod should be in motion, preferably backwards and forwards towards the anodes, about 3 inches either way. The backward and forward motion should be about 10 per minute.—C. H. P. Problem 3,459.

SPOTTED BRASS PLATE

Q.—The trouble we have in brass plating iron handles is that they get spotty after they are lacquered. We are sending you a sample under separate cover. We even tried the nickel strike on these handles, but still the dark spots will work out just the same as the other way.

A.—Your spotting problem, which results from brass plating iron handles, is a prevalent one at this time of the year. The spotting is actually due to minute porous spots in the iron. The plating solution becomes occluded in such porous spots and eventually (even when lacquered) come to the surface by absorption of atmospheric moisture during humid days.

The only solution of your problem is to be more careful in thoroughly washing and drying the product. Wash thoroughly in cold and boiling hot water for several times; to the hot water add 1/16 to ⅛ oz. acetic acid. Finally dry out the product at 212° F. before finishing and lacquering. In some instances the immersion of the product in heated ethyl acetate before lacquering will prevent the final spotting out. Ethyl acetate should be heated by the aid of a hot water bath; the receptacle tightly covered when not in use. One or the other methods should overcome your spotting out trouble.—C. H. P. Problem 3,460.

SPOTTED NICKEL ON BUMPERS

Q.—I am sending you under separate cover two sample D clips as used on automobile bumpers. These are zinc plated and then nickel plated. We have done this plating on bumpers and parts for the last seven months, but just recently have been having complaints on the finished work turning white, and white spots showing up after the bars have been shipped. You will notice spots on the samples even before they have been buffed. However, after buffing they are not noticed for several days. I believe it is due to a chemical reaction between the zinc and the nickel.

A.—The spots that show up through the nickel plated surface are oxide of zinc spots. The cause of these spots is, no doubt, due to hydrogen pitting in the nickel. The moisture collects in these pits and the zinc becomes oxidized, resulting in the white spots. You might try the following solution and see if it is possible to produce a nickel deposit free from hydrogen pitting. Water, 1 gallon; sodium sulphate crystals, 16 ozs.; single nickel salts, 10 ozs.; boric acid 1½ oz.; ammonium chloride, 2 ozs.; sodium perborate 1/15 oz. The latter material is to be dissolved in warm water and added when the solution is ready for use. A flash brass deposit on the zinc plated surface may also assist in producing a more satisfactory nickel plated surface, free from pitting and the resulting white spots you experience under present methods.—C. H. P. Problem 3,461.

SPOTTING OUT

Q.—I have had trouble with brass and bronze plated castings spotting out. Do you know of any remedy besides heating or allowing the work to hang so as to dry out.

A.—To prevent spotting out, after plating, wash the articles in cold and boiling waters, alternating twice. Then while hot from the boiling water, immerse in a cold solution of bicarbonate of soda, water, 1 gallon; bicarbonate of soda, 1 to 2 ozs. Immerse the articles in this solution for an hour or more. If no reaction results on the deposit from the immersion again wash in cold and boiling waters and bake at 212° F. until the moisture is evaporated from the pores of the metal. Let us know the results as the spotting out problem is still a difficult problem. This suggestion is a new angle to overcome the problem.—C. H. P. Problem 3,462.

VALVE MIXTURES

Q.—Please find enclosed a sample of a section of a chronometer valve. We have tried several alloys. The sample is an alloy of copper 86, tin 7, zinc 4 and lead 3. Every valve leaked under pressure. You will note that the section cast in the core has a sand stone fracture, while the section of the mold shows a fibrous fracture. In your opinion could this valve be cast in manganese bronze?

A.—On examination of your sample furnished, I find your trouble is due to shrinkage and most likely this trouble is due to the manner of gating. If you could try one gated with a horn gate, it would prove whether your gating is at fault.

I realize it would not be practical but it would prove to your satisfaction if your gating is properly done.

However, I can give you a mixture that will not shrink as much and will answer your purpose. This mixture is used by the air brake people and is very satisfactory. It consists of 73 copper, 18 zinc, 7 lead and 2 tin. If you do not pour too hot I think you will have satisfactory results. Your casting can be made of manganese bronze but you would have to have the proper risers and gates to take up the shrinkage. You, of course, realize the importance of the pouring temperatures on all metal.

Your trouble is shrinkage. How it occurs, I can only surmise. The principal cause of shrinkage is improper gating and pouring temperature and the composition of the alloy. Different compositions require different methods of gating, etc.—W. J. R. Problem 3,463.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,549,137. August 11, 1925. **Alloy of Lead and Alkaline Earth Metal.** Walther Mathesius, Charlottenburg, Germany.

A lead alloy containing about 3 per cent of calcium and about 1 to 2 per cent of another alkaline earth metal, such alloy being substantially free from metals other than those stated.

1,549,233. August 11, 1925. **Sectional Anode.** Van Winkle Tood, Millburn, N. J., assignor to The Hanson & Van Winkle Company, Newark, N. J.

A sectional anode comprising in combination, an insoluble anode stem having a dove-tail holder rib and a plurality of separable anode sections adapted to engage with and be held by the said dove-tail holder in any desired position.

1,549,409. August 11, 1925. **Sand Blasting.** James H. Gravell, Elkins Park, Pa.

The method of etching metal which consists in sand blasting the metal in the presence of a salt of phosphoric acid.

1,549,410. August 11, 1925. **Rust-Removing Composition for Metals.** James H. Gravell, Elkins Park, Pa.

A cleaning agent for metals comprising free phosphoric acid, water, alcohol and mono-sodium phosphate, substantially as described.

1,549,442. **Method of and Composition for Cleaning Metals.** Bruce K. Brown, Terre Haute, Ind., assignor to Commercial Solvents Corporation, Terre Haute, Ind.

The method of cleaning iron and preserving it from rusting consisting in submitting it to the action of an admixture of 4-hydroxy-2-keto-4-methyl pentane and an acid forming insoluble iron salts and removing said admixture from the iron.

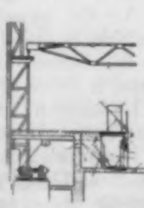
1,550,192. August 18, 1925. **Process of Recovering Aluminum.** Karl Martell Wild, Stuttgart, and Friedrich Ehrmann, Feuerbach, Germany, assignors to Bosch-Metallwerk Aktiengesellschaft, Feuerbach, Germany.

The process of recovering aluminum and other light metals or alloys thereof from sheet-metal waste, chips, sweepings, and other residues, consisting in preparing a bath from a metal like that to be produced with the aid of coarse pieces of the respective metal, introducing gradually the respective residues, etc., into said bath, adding a fluxing chloride to the mixture formed by the metal-bath and the waste or residues, etc., covering the whole with a layer of a substance adapted to prevent contact of the recovered metal with the air, and stirring thoroughly the thus prepared bath below said layer.

1,550,280. August 18, 1925. **Aluminum Welding Compound.** Fred Post, Peekskill, N. Y.

An aluminum welding powder containing approximately the following proportions: 36.65 per cent of lithium-chloride, 30.40 per cent of potassium-chloride, 22.65 per cent of sodium-chloride, 8.20 per cent of potassium-sulphate, and 2.10 per cent of kryolite.

1,550,401. August 18, 1925. **Device for Charging and Discharging Smelting Furnaces.** Manuel Tama, Wannsee, near Berlin, Germany, assignor to Ajax Metal Company of Philadelphia.



A device for charging and discharging smelting furnaces, especially electric smelting furnaces for brass and similar alloys, comprising, in combination, a furnace adapted to be tilted; a divided charging floor, one portion being stationary, another portion being adapted to be tilted together with the furnace, said other portion lying flush with the first-mentioned portion of the charging floor when the furnace is in its position of rest; and means for tilting the furnace and the appertaining floor-portion.

1,550,730. August 25, 1925. **Alloy.** Emil Maass, Berlin-Halensee, Germany, assignor of one-half to Marburg Brothers, Inc., New York, N. Y., a corporation of New York, and one-half to R. Stock & Co., Spiralbohrer-, Werkzeug-, & Maschinenfabrik A. G., Berlin-Marienfelde, Germany.

An alloy of the character described, consisting of one hundred parts of zinc, approximately three parts of copper, and about five parts of aluminum.

1,551,443. August 25, 1925. **Bearing Metal.** Eugene Vaders, Heddernheim, near Frankfort-on-the-Main, Germany, assignor to Heddernheimer Kupferwerk und Sueddeutsche Kabelwerk, Aktiengesellschaft, Frankfort-on-the-Main, Germany, a corporation of Germany.

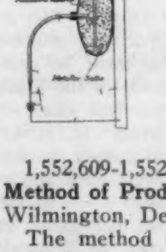
A brass alloy containing .6-1.5 per cent of silicon and manganese in amount sufficient to neutralize the detrimental effects of the silicon.

1,551,613. September 1, 1925. **Coated Aluminum Articles and Process and Means for Producing Same.** Aladar Pacz, East Cleveland, Ohio, assignor to Aluminum Company of America, Pittsburgh, Pa.

The process of producing a colored non-metallic coating on an aluminum article which comprises cleaning the surface of the said article, forming a solution of approximately one part of concentrated aqua-ammonia, nine parts of water, and from about one to three parts by weight of an ammonium salt, adding thereto a small amount of an ammoniacal solution of salts of silver and one or more other colored modifying metals, and immersing therein the said article until a colored coating is formed thereon.

1,552,040-1-2. September 1, 1925. **Process of Making Protected Metal.** Frederick M. Crapo, Muncie, Ind.

The method of producing a zinc-coated iron or low-carbon steel article, consisting in increasing the carbon content of the surface of an iron or low-carbon steel ingot with relation to that of the interior of such ingot, working such ingot to produce the desired article, and zinc-coating such article.



1,552,591. September 8, 1925. **Metal-Plating Device.** Peter J. F. Batenburg, Racine, Wis.

In a metal plating device, the combination of an anode, a yieldable displaceable absorbent filter, salts of the metal to be deposited associated with the filler, and a piece of porous polishing material enclosing said anode and filler, a current conductor secured to the anode, and means for binding said polishing material about said conductor.

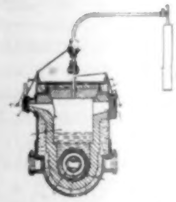
1,552,609-1,552,610. September 8, 1925. **Nickel Anode and Method of Producing the Same, Etc.** Noak Victor Hybinette, Wilmington, Del.

The method of producing nickel anodes which comprises oxidizing a nickel bath, deodorizing the oxidized bath with a deoxidizer forming a non-gaseous oxide, and casting the deoxidized metal, the deoxidizing of the metal being insufficient to render the metal tough and malleable.

1,552,769. September 8, 1925. **Magnetic Alloy.** Willoughby Statham Smith, Newton Poppleford, and Henry Joseph Garnett, Sevenoaks, England.

An alloy comprising nickel 49 per cent to 71 per cent, iron 17 per cent to 25 per cent, and copper 15 per cent to 25 per cent.

1,552,865. September 8, 1925. **Process for Melting Light Metals and Alloys Thereof in Electrical-Induction Furnaces.** Thomas Metzger, Dusseldorf-Gerresheim, Germany.



A process for melting aluminum, magnesium and like light metals and alloys thereof in induction furnaces, consisting in filling the interior of the furnace above the melt bath with neutral gas at such pressure that the pressure of the molten metal increased by the gas pressure results in a total pressure in the secondary circuit eliminating or reducing to a minimum the Pinch effect in the melt.

1,552,952. September 8, 1925. **Anode.** Howard George Rice, Waterbury, Conn.

In an anode for electroplating baths, a core of gradually diminishing size from top to bottom, said core being angular in cross section, a plurality of integral prongs projecting from said core in opposite directions, said prongs being angular in cross section and pointed at their extremities.

1,554,241. September 22, 1925. **Plant for Treating Metal Articles.** David L. Summey, Waterbury, Conn., assignor to Scovill Manufacturing Company, Waterbury, Conn.

In a plant for treating metal articles, the combination with a heating furnace, of means for automatically delivering the articles thereto, a cooling tank, and finishing means, including means for applying a pickling liquor, then washing, then applying a soda solution and a soap solution, to the action of which the articles are automatically subjected after delivery from the cooling tank.

1,554,483. September 22, 1925. **Metod of Cleaning Aluminum.** Preston Perkins Bailey and Etta Maue Bailey, Boundbrook, N. J.

The method of cleannig aluminum which comprises placing aluminum in a solution containing a compound of an organic acid and a material forming a source of carbohydrates, boiling the solution, removing the aluminum, and washing it.

1,554,493. September 22, 1925. **Method of Making Bearings and the Like.** Charles W. Eggenweiler, Detroit, Mich., assignor, by mesne assignments, to Bohn Aluminum and Brass Corporation, a Corporation of Michigan.

In the method of making bearings and the like, the forming of an oversized cylindrical blank having a wall of greater thickness than the wall of the final article, the diametrical severing of the blank to produce two segmental members and the finishing of the wall of each segmental member while having the same arc as the final article to produce the desired thickness of the wall of the final article.

1,555,313. September 29, 1925. **Process of Melting and Degasifying Metals Under Reduced Pressure.** Wilhelm Rohn, Hanau, Germany.

The process of melting and degasifying metal alloys and their compounds with metalloids, consisting in melting these metals, under a reduced pressure in a practically absolutely airtight furnace under a constant pressure of any value between 1000 grammes per square centimeter and practically nil, according to the purpose intended and at a desired temperature.

1,555,314. September 29, 1925. **Process for Improving the Quality of Metals or Melting Under Reduced Pressure.** Wilhelm Rohn, Hanau, Germany.

The process of degasifying more or less impure metals consisting in regulating the composition of such metal by suitable additions and melting them under a reduced pressure within a practically airtight furnace under a constant pressure which may vary from one thousand grammes per square centimeter to practically zero according to the purpose intended and at a suitable temperature.

1,555,468. September 29, 1925. **Electroplating Machine.** Wesley F. Hall, Matawan, N. J., assignor to The Hanson & Van Winkle Company, Newark, N. J., a Corporation of New Jersey.

In an electroplating machine comprising an electroplating vat, means for carrying articles down into the vat along the vat and then lifting them out of the vat with means for varying the distance of their travel longitudinally in the vat.

1,555,891. October 6, 1925. **Holder for Articles to be Electroplated.** Floyd T. Taylor, Matawan, N. J., assginor to A. P. Munning & Co., New York, N. Y.

A tumbling apparatus of the class described comprising a rotatable work holder, a work-receiving basket hung therefrom, means for supporting said work holder in position over a tank, and means whereby said basket may be detached from said holder while the latter is in operative position relative to its supporting means.

1,555,927. October 6, 1925. **Coating for the Prevention of Rust or the Like.** Edgar Ford Morris, Manchester, England, assignor of one-half to James Anderson Morrice, Glasgow, Scotland.

The process for preventing the formation of rust on iron or other ferrous metals which consists in first coating the metal with an aqueous emulsion prepared from a paint containing zinc yellow (basic chromate of zinc) to which has been added an emulsifying agent dissolved in water and a volatile thinner and allowing said coating to dry and then applying a second coating consisting of a paint containing zinc yellow.

1,555,956. October 6, 1925. **Melting and Pouring Magnesium.** Herman E. Bakken, Niagara Falls, N. Y., assignor to American Magnesium Corporation, Niagara Falls, N. Y.

The process of treating magnesium and its alloys comprising melting the metal in a container in the substantial absence of reactive gases and during the pouring operation, protecting the molten metal by introducing glycerine into the said container.

1,555,959. October 6, 1925. **Light Alloy and Process of Manufacture of the Same.** André Angelo Fresneau, Aubervilliers, France.

A metal alloy the composition whereof is substantially: aluminium 93.3, copper 3.4, nickel 1, zinc 1.8 and magnesium 0.5.

1,556,022. October 6, 1925. **Aluminum Solder.** Aron L. Penner, Winnipeg, Manitoba, Canada, assignor of one-half to Jacob F. Froese and one-half to John F. Froese, both of Reinland, Manitoba, Canada.

An aluminum solder comprising the following metals in substantially the following relative parts by weight, respectively: lead, 13 parts, tin, 11 parts, zinc, 4 parts, aluminum, ¼ part, antimony, 1 part.

1,556,212. October 6, 1925. **Electric Furnace.** Charles B. Foley, Bristol, Conn., assignor to Charles B. Foley, Inc., New York, N. Y.

An electric furnace comprising a receptacle adapted to hold a pool of molten metal, said receptacle having interior walls adapted to form a portion of the molten metal into a plurality of loops depending from the bottom of the pool.

1,556,271. October 6, 1925. **Method and Anode for Electrodeposition of Rust-Resisting Coatings.** Christian John Wernlund, Tottenville, N. Y., assignor to The Roessler & Hasslacher Chemical Company, New York, N. Y.

Method of electrodepositing a rust resistant deposit of cadmium and zinc which consists in electrodepositing these metals from a solution of their salts in an aqueous sodium cyanide-sodium hydroxide solution.

1,556,272. October 6, 1925. **Method and Anode for Electrodeposition of Rust-Resisting Coatings.** Christian John Wernlund, Tottenville, N. Y., assignor to The Roessler & Hasslacher Chemical Company, New York, N. Y.

Method of electrodepositing a rust resistant deposit of zinc, cadmium and mercury which consists in electrodepositing these metals from a solution of their salts in an aqueous sodium cyanide-sodium hydroxide solution.

1,556,591. October 13, 1925. **Process for Melting and Refining of Nonferrous Metals.** Daniel Cushing, Lowell, Mass., assignor to The Barrett Company, a Corporation of New Jersey.

The process which comprises melting a non-ferrous metal while in direct contact with incandescent pitch coke which is substantially free from ash and materials that would have a deleterious effect upon said metal.

1,556,752. October 13, 1925. **Dentist's Plater.** Robert W. Blake, Indianapolis, Ind.

A portable self-contained electro-plating apparatus, comprising an enclosing casing divided horizontally into an upper and lower compartment and provided with a hinged cover and with a removable end wall, said container being divided into two compartments by a horizontally disposed shelf, an electro-plating container mounted in the upper compartment upon said shelf, a pair of binding posts mounted upon the upper surface of said shelf, electric batteries mounted in the bottom compartment of the container and having their terminals respectively connected to said binding posts, said end member and cover being arranged, when closed, to completely enclose and protect all of the parts of the apparatus within the casing and when open, to permit access respectively to the batteries in the bottom compartment and to the elecroplating container.

1,556,953. October 13, 1925. **Alloy.** Samuel W. Parr, Urbana, Ill.

An alloy comprising nickel, copper and aluminum, substantially as described, to which has been added manganese not less than 1/10 per cent nor more than 1% and tantalum in an effective amount not exceeding 8%.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

RADIAL SWING FRAME GRINDER

This machine, made by the Bridgeport Safety Emery Wheel Company, Bridgeport, Conn., is without belts or countershafts of any sort or overhead suspension of any kind. It will operate in or out, up or down, on horizontal surfaces or surfaces at any angle and completely around its base. It may be located anywhere.

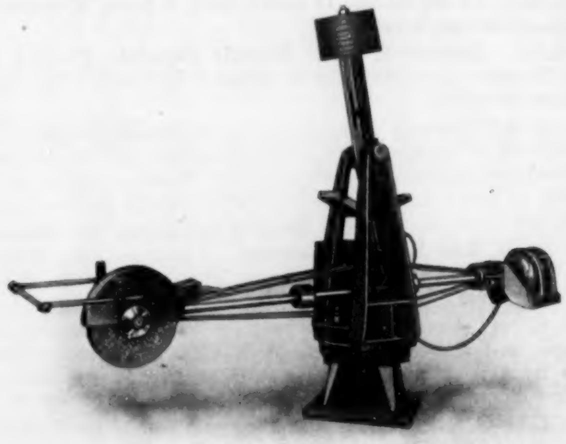
The machine consists essentially of two counterbalanced arms mounted on a horizontal plate, which may be rotated about to any position. As these arms are always in balance, the center of gravity is always over the center of the base. On account of this accurate poise, the operator may let go of the handles at any time, whether the machine is running or not and be assured that it will stay practically where he left it.

The horizontal arm carries the grinding wheel at one end and is counterbalanced by the driving motor on the other. This arm is a tubular member trussed with rods to provide necessary strength and stiffness. The power is transmitted to the spindle by a driving shaft coupled to the motor, running through this tube, and connected to the spindle by high grade, carefully cut and heat-treated bevel gears. The driving shaft is carried by three large capacity ball bearings, one at each end and one in the middle.

The grinding wheel is carried on the outboard end of the spindle so that in changing wheels, it is only necessary to remove the guard. The spindle is carried in large ball bearings, mounted entirely inside the housing which carries the bevel gears. This housing is dust and dirt proof and filled with transmission oil, which insures continual lubrication for gears and bearings. The grinding head may be clamped on the horizontal arm or may be left free and easily held or revolved about to any angle, on end or upside down, as the operator may desire.

Great ease of horizontal rotation is obtained by a ball bearing turntable. The entire weight of the rotating member is carried on a circle of very accurate steel balls. This circle is of large diameter and the balls entirely fill it. A gib ring hooks in under the flange of the base, but does not quite touch it. This provides protection against grit and any possibility of overturning.

The machine as furnished is completely wired, ready for hooking on the line wires, unless otherwise ordered. This includes push button control on the grinding head, directly at hand.



BRIDGEPORT RADIAL SWING FRAME GRINDER

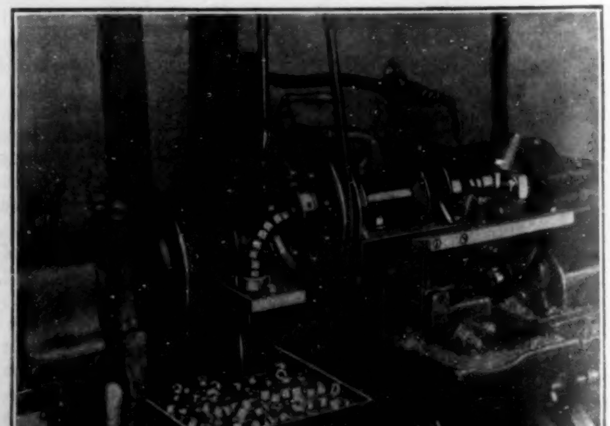
NEW AUTOMATIC NUT THREADING ATTACHMENT

The Automatic Nut Thread Corporation, 24 West Tupper street, Buffalo, N. Y., is putting on the market a device for threading nuts and other small parts as they are formed on automatic screw machines, which eliminates the use of the reverse drive and the independent tapping machine. It is called the Automatic Nut Threading Attachment and is used in conjunction with the transfer arm of the Brown & Sharpe slotting attachment. It taps the nuts or other parts as they are formed and cut off.

The attachment works in the following manner: A plunger is fitted on to the slotting attachment transfer arm. This plunger enters the nut blank as soon as it is drilled, and when it is cut off immediately swings the blank nut over to the threading attachment, which takes the place on the automatic screw machine of the usual slotting attachment head. As the transfer arm reaches the upright position, it pushes the blank forward into a hexagon socket or chuck, which revolves around the tap. The nut is automatically carried on to the tap, passes through a hollow spindle, and slides out at the end of the tap shank, the dropping of the nuts being controlled by a special sleeve arrangement so that the tap which is of the floating type, is always full of the nuts. The taps are bent at the shank end at an angle of 90°.

The attachments are simple in construction and sturdily built. The spindle is mounted in the best type of ball bearings. The necessary adjustments are few and can readily be made by any good set-up man.

The makers claim for the attachment that it makes a great saving in production costs by doing away with the necessity of sorting



AUTOMATIC NUT THREADING ATTACHMENT

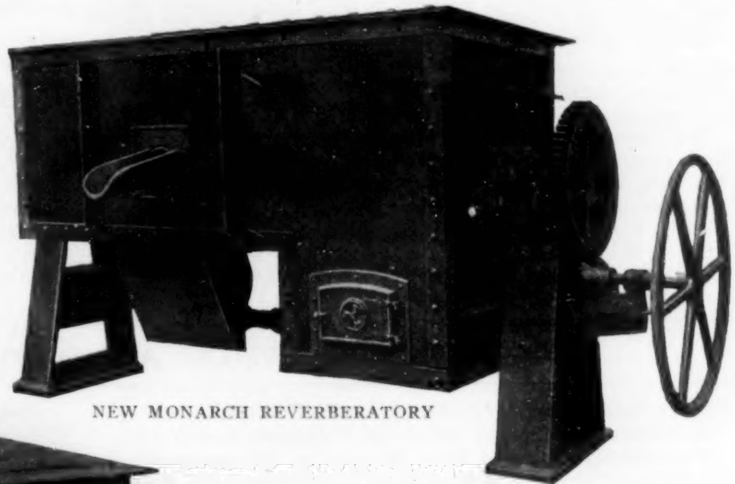
the blanks from the scrap in the pan, cleaning them, and sending them to an independent tapping machine, as it taps them simultaneously with their being formed. It eliminates tap breakage, and reduces inspection rejections to a minimum, the finished nuts, tapped in this manner, being practically all of full thread, and tapped square with the face.

At the present time, attachments are being supplied for Brown & Sharpe automatic screw machines No. 00, No. 0 and No. 2. The makers expect very shortly to perfect attachments for use with other makes of automatic screw machines.

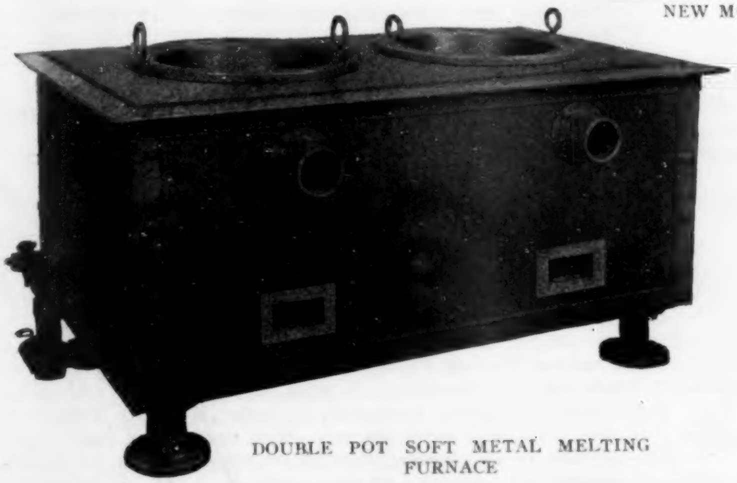
NEW MONARCH FURNACES

The Monarch Engineering & Manufacturing Company of Baltimore, Md., exhibited two types of furnaces at the Convention of the American Foundrymen's Association in Syracuse, N. Y., October 5-9, 1925. One of these was a tilting or stationary coke, coal or wood fired reverberatory furnace for smelting, melting and refining metals. This furnace is built in capacities from 500 to 2,000 lbs. per heat and is provided with a metal feeding hopper; also a charging hole for fuel. Air is supplied at a pressure of 2 ounces or more according to the nature of the metal to be melted. Construction of the furnace is such that the metal is pre-heated by the escaping flue gas before melting.

No crucibles are used. The lining is said to be inexpensive and large pieces of metal can be charged without breaking up. The furnace operates continuously and the fuel consumption is said to be 1 pound of coke to 5 or 6 pounds of metal melted.



NEW MONARCH REVERBERATORY



DOUBLE POT SOFT METAL MELTING FURNACE

A double pot furnace was exhibited for melting soft metals, such as lead, tin, antimony alloys, zinc and aluminum. These furnaces can be supplied in pots of a capacity running from 100 pounds upward and suitable for railroads, automobile plants, foundries, etc. Each furnace has its own individual burner and is operated with an air pressure of from 8 to 16 ounces.

FINE ZINC WIRE

Fine zinc wire of 1½ millimeter diameter is being supplied for use in Schoop spray pistols by the Metals Coating Company of America, Philadelphia, Pa.

NEW WHEEL BALANCER

The Ideal Wheel Balancer, an invention of Joseph Roche of Battle Creek and Detroit, has just been put on the market.

The common method of "balancing" a buffing or grinding wheel is to attach lead weights or plugs to the side of the wheel with its attendant danger to the operator, to say nothing of the time wasted in trying out the weights until just the right amount has been added.

Aside from the consideration of safety, the time required to balance a wheel, before mounting on the jack, by the old method and often at the hands of a workman who must virtually "cut and try" until he gets his distribution of weights just right, is hard to calculate, much less control.

The application of the Ideal Balancer is said to be simple. The device is attached to the side of the wheel with four screws. The wheel is then mounted on the shaft, which of course runs through both wheel and balancer and clamped with the usual washer and nut.

The movable weights in the concentric slot are then moved as necessary to the required balance and tightened with the simple internal hexagon wrench.

If necessary the weights can be shifted from time to time if the wear of the wheel itself causes change in balance. When a wheel is worn out the balancer can be removed and used over and over again on new wheels. Naturally there are no wearing parts.

OLD STYLE WHEEL

NO. 1 IDEAL BALANCER—INSET

NO. 2. FELT-SUB WHEEL

John Roche, the inventor, is a practical polisher by trade and has given the device the most thorough tests in his own shops. It is claimed that many other manufacturers operating polishing departments have adopted it as standard. It can be supplied for all standard sizes of wheels.

Special applications for balancing fly wheels are also being made either by attaching to the wheel or by incorporating the Ideal construction in the design of the wheel itself.

The Ideal Balancer is now being made in Detroit, Mich., by the Roche Ideal Balancer Company, where Mr. Roche has started quantity production.

METAL COATING PROCESS

The Callender Soldering Process Company announces that they have recently perfected a process of tin or solder coating grey iron and malleable castings, also articles made of copper. The processes use only three operations, only the metal pot being heated. Very excellent results are said to have been obtained.

No muriatic acid whatever is required. This has formerly been used and the castings often become over-pickled. To remove this soft film, caused by over-pickling, it is necessary to allow the castings to rust, which is a waste of time, or the castings must be tumbled again. Castings cannot be properly coated with any soft metal if they are over-pickled. In this process they do not pickle the castings. They are taken right from the tumbling barrel and do not enter an acid bath, even when the castings are a little rusted. It is not necessary, it is claimed, to pickle the castings to remove this rust.

COPPER-CLAD ASPHALT

Commercial production of a copper covered non-metallic substance has been accomplished and put to a large industrial use according to an announcement made by the Anaconda Copper Mining Company, of New York.

The success of the new process unites the interests of two large industries, copper and asphalt, in the production of roofing materials. The achievement gives the country a new product—copper clad asphalt shingles. The roofing is asphalt covered and impregnated with copper by the process of galvanoplasty.

EQUIPMENT AND SUPPLY CATALOGS

Sheet Lead. Hoyt Metal Company, St. Louis, Mo.

Hardinge Rotor Spray. Hardinge Company, New York.

Mechanically Operated Flow Meters, for Measuring Fluids and Gases. General Electric Company, Schnectady, N. Y.

Wire Straighteners, Metal and Wire Reels, Tool and Die Grinders. Baird Machine Company, Bridgeport, Conn.

Facts about Bridgeport. Bridgeport Chamber of Commerce, Bridgeport, Conn.

Boiler Room Operations, by G. F. Gebhardt. Republic Flow Meters Company, Chicago, Ill.

Steel and Its Heat Treatment, by H. M. Boylston. Republic Flow Meters Company, Chicago, Ill.

Heavy Clay Products and Their Manufacture, by C. W. Parmelee. Republic Flow Meters Company, Chicago, Ill.

Foremanship. Department of Manufacture, Chamber of Commerce of the United States, Washington, D. C.

Monel Metal and Nickel Buyers' Guide. International Nickel Company, New York.

American H. S. Fans. American Blower Company, Detroit, Mich.

Hardinge Super Thickener and Clarifier. Hardinge Company, New York.

Methods of Compensating Office Employees. Metropolitan Life Insurance Company, New York.

Zinc Etcher's Plates. American Nickeloid Company, Peru, Ill.

Belted Synchronous Motors. Electric Machinery Manufacturing Company, Minneapolis, Minn.

Monel Metal for Corrosion Resisting Metal for Chemical Engineering Equipment. International Nickel Company, New York.

Insulation and Insulating Specialties. J. H. Gautier and Company, Jersey City, N. J.

Power Transmitting Machinery. A. & F. Brown Company, Elizabethport, N. J.

Recording Pyrometers. Brown Instrument Company, Philadelphia, Pa.

Heat-Resisting Alloys, by Victor Hybinette, Wilmington, Del.

Extraction of Iron. Dings Magnetic Separator Company, Milwaukee, Wis.

Cold Rolling Mills. Blake & Johnson Company, Waterbury, Conn.

Aluminum in the Chemical Industries. Aluminum Company of America, Pittsburgh, Pa.

Practical Plating Pointers. A Hand Book of Useful Information for Platers of Copper, Nickel, Brass and Zinc. Meaker Galvanizing Company, Chicago, Ill. The publishers of this little book have, for more than twenty-five years, been important in the development of electro-deposition of metals as a practical industry. In the course of their long experience they have naturally acquired a considerable fund of practical working knowledge in the technical phases of this industry gained by actual experience, hard knocks and costly lessons, and by contact with the thoughts and experiences of others. The Meaker Galvanizing Company has gathered together a picked selection of these practical pointers into a little book, under the above title. It contains many helpful suggestions for the successful conduct of the plating and galvanizing room, and several useful tables and formulae for the convenience of the plater and manufacturer. There is no charge for the book.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

Testing Materials Society Committee Meetings

HEADQUARTERS, 1315 SPRUCE STREET, PHILADELPHIA, PA.

A group meeting of the committees of the American Society for Testing Materials was held at the Hotel Cleveland, Cleveland, Ohio, on Tuesday, Wednesday and Thursday, October 27, 38 and 29, in which 14 committees took part. Among them were the following:

A-5 on Corrosion of Iron and Steel.

B-2 on Non-Ferrous Metals and Alloys.

B-3 on Corrosion of Non-Ferrous Metals and Alloys.

B-4 on Metallic Materials for Electrical Heating.

In addition, meetings were held of the Joint Research Committee of the A. S. T. M. and the A. S. M. E. on the Effect of Temperature on the Properties of Metals and of the Sectional Committee on Fire Tests of Materials and Construction, functioning under the rules of the American Engineering Standards Committee. The meetings were attended by about 275 members and guests, representing the various industries concerned.

COMMITTEE A-5 ON CORROSION OF IRON AND STEEL

The committee has prepared a tentative specification for galvanized sheets for various uses; and it has in preparation specifications for galvanized wire and pipe.

Important investigations are in progress on methods of analysis and test of zinc coatings. There is a desire to secure some form of accelerated test which will be indicative of the probable value of products for the conditions prevailing in various classes of service.

The outstanding feature of the work of Committee A-5 at this time is the elaborate series of tests of metallic coatings which was first announced early in the year and reported upon in considerable detail at the annual meeting of the society. There has been a growing demand for authentic comparative data on the relative resistance of various metallic coatings, such as zinc, lead, tin and copper, to corrosion under various media, such as the atmosphere, various kinds of water, and other corrosive agencies. The committee is planning to expose to the weather metallic-coated sheets, wire, structural shapes, hardware and the like at five localities, namely, Key West, Fla.; Sandy Hook, N. J.; Pittsburgh, Pa.; Altoona, Pa., and Pennsylvania State College. In this way a wide range of atmospheric conditions will be brought into the test.

The committee is taking up first on their program the zinc-coated articles, including such types of coating as hot-dip galvanizing, sherardizing, electro plating and spraying. Following these the committee will take up such coatings as cadmium plating, aluminum dip, calorizing, lead dip, and tin and terne plate.

Parallel to these atmospheric tests is a series of accelerated corrosion tests. It is the object to find that accelerated test which will most nearly check long-time exposure results.

COMMITTEE B-2 ON NON-FERROUS METALS AND ALLOYS

A meeting of Committee B-2 on Non-Ferrous Metals and Alloys, presided over by Vice-Chairman W. H. Bassett, American Brass Company, Waterbury, Conn., was held in Cleveland on October 28, at which time the reports of its various sub-committees were reviewed.

The Sub-Committee on Wrought Metals and Alloys is at work on harmonizing its specifications for cartridge brass with those of the Ordnance Department.

The Sub-Committee on Sand-Cast Metals and Alloys submitted four new specifications. One covers aluminum bronze, the aluminum content ranging from 7 to 11 per cent. Valve bronze of two compositions are covered in two other specifications, the first bronze being 88-8-4 composition and the second the well-known 85-5-5-5. The fourth covers ordinary brass castings.

The Sub-Committee on White Metals recommended the advancement to standard of the Tentative Specifications for White Metal Bearing Alloys (Babbitt Metal) (B 23-18 T).

The Sub-Committee on Chemical Analysis is at work on revisions of the Tentative Methods of Analysis of Aluminum and Light Aluminum Alloys and of the standard methods of analysis of brass and bronze.

The Sub-Committee on Light Metals and Alloys wishes to present with the next annual report of the committee an article on duralumin and the newer light silicon-aluminum casting alloys (modified alloys). New specifications were presented for Aluminum Base Sand-Casting Alloys in Ingot Form.

The organization of a new Sub-Committee on Wrought Zinc was authorized.

COMMITTEE B-3 ON CORROSION OF NON-FERROUS METALS ALLOYS

Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys held a well-attended meeting, at which, in the absence of the chairman, the vice-chairman, H. S. Rawdon, Physicist, U. S. Bureau of Standards, Washington, D. C., presided. This committee, it will be recalled, is conducting an extensive series of tests designed to study the following methods of conducting and interpreting corrosion tests, to the end that if possible standard corrosion tests may be formulated:

Total Immersion Tests.
Alternate Immersion Tests.
Spray Tests.
Accelerated Electrolytic Tests.

Complete instructions and details for conducting these tests have been issued to 27 co-operating laboratories, who agree to make one or more of these four tests, the materials tested being admiralty metal, aluminum, copper, lead, nickel and zinc.

COMMITTEE B-4 ON METALLIC MATERIALS FOR ELECTRICAL HEATING

At the Cleveland meeting of the A. S. T. M. committees held at the Cleveland Hotel, October 27, there was organized a new committee of the society whose field of activities is briefly stated by its title, namely, Committee on Metallic Materials for Electrical Heating. Last June a conference of representatives of interested industries agreed on the need for technical study of metallic-resistance materials that are used in manufacturing various kinds of electric-heating apparatus which operate at relatively high temperatures. A direct outcome of this conference was the decision of the Executive Committee of the society that the new committee should be immediately organized.

The committee will first undertake the preparation of standard methods of testing, as preliminary to the investigation of the properties of electric-resistance materials and leading eventually to the development of quality specifications.

JOINT RESEARCH COMMITTEE ON THE EFFECT OF TEMPERATURE ON THE PROPERTIES OF METALS

An all-day session of this committee was held at the Cleveland Hotel, at Cleveland, October 26, under the chairmanship of G. W. Saathoff. The meeting was in conjunction with the group meetings of A. S. T. M. committees held there on October 27-29.

A set of tests is planned for the determination of the tensile properties of these metals under elevated temperatures. The committee discussed plans contemplating contemporary work on other physical properties of metals at high temperatures, such as fatigue phenomena, corrosion, erosion, etc. This work will be allotted to other co-operating laboratories than those working on the present group of tests.

The plans were formulated for a survey to obtain reports from users of metals concerning their experience in finding suitable materials for use under severe service conditions involving abnormal temperatures, either above or below normal.

AMERICAN FOUNDRYMEN'S ASSOCIATION

HEADQUARTERS, 140 S. DEARBORN ST., CHICAGO, ILL.

The date has been set, tentatively, for the 1926 convention of the American Foundrymen's Association. It will be held in Detroit, Mich., during the week of September 27-October 1, inclusive.

QUAD-CITY FOUNDRYMEN

HEADQUARTERS, CARE OF D. H. WARD, UNION MALLEABLE IRON COMPANY, EAST MOLINE, ILLINOIS

The Quad-City Foundrymen's Association held their second meeting of the year at the Le Claire Hotel, Monday evening, Oct. 19, at 6:30 p. m. Eighty members were present.

The meeting was devoted entirely to reports and discussions of the various papers read at the annual foundrymen's convention at Syracuse, N. Y., on Oct. 5 to 9. Fred Kirby, of the Marseilles Works, touched on the apprenticeship meetings. Max Sklovsky, of Deere & Company, reported on the paper submitted at the sand meetings. J. H. Diedrich, of The Black Hawk Foundry Company, spoke on the problems of the aluminum foundry, as presented at the convention. A. E. Hageboeck gave a brief resumé of the personnel of directorate of the American Foundrymen's Association and the work being done along cost lines by the various members of the association.

AMERICAN ELECTRO-PLATERS' SOCIETY

CHICAGO BRANCH

HEADQUARTERS, CARE OF ROBT. MEYERS, 2210 WILSON AVE.

The next annual event on the part of Chicago Branch, American Electro-Platers' Society, will be held on Saturday afternoon and evening, January 23, 1926. This affair will consist of an educational session on Saturday afternoon, January 23, with banquet and dinner dance following immediately after the close of the educational session in the afternoon. Further and more complete details will follow later.

NEW YORK BRANCH

HEADQUARTERS, CARE OF JOHN E. STERLING, 468 GRAND AVENUE, LONG ISLAND CITY, N. Y.

The October meetings of the New York Branch were well attended. The feature of the first meeting was the lively discussion on Chromium Plating. William Schneider addressed the meeting and gave his views and experiences. The second meeting was also very lively in discussion. Messrs. Schwartz, Dupbernell and Haddow engaged in a warm debate, Mr. Haddow upholding the old type double nickel solutions and Messrs. Dupbernell and Schwartz advocating the modern single salt solutions.

A committee was appointed for the coming banquet as follows: Mr. Morningstar, chairman, assisted by Messrs. Minges, McStocker, Miller and Sterling.

PHILADELPHIA BRANCH

HEADQUARTERS, CARE OF PHILIP UHL, 2432 N. 29TH STREET

The Philadelphia Branch will hold its annual banquet on Saturday evening, November 21, 1925, in Moseback's Hall, Philadelphia. It will, as usual, be divided into two sessions—educational and entertainment. The speakers for the afternoon educational session will be as follows.

Dr. Wm. Blum, Washington, D. C. What Becomes of the Volts in a Plating Tank.

George Hogaboom, Newark, N. J. The Preparation of Surfaces to be Electro-plated.

A. P. Munning, Matawan, N. J. The Ammeter.

Mr. Bleates, Philadelphia, Pa. Nickel Types.

Dr. H. Lukens, Philadelphia, Pa., and a representative of the Victor Talking Machine Company, will also present papers but the subjects have not yet been announced.

Wilfred S. McKeon, Greensburg, Pa. Sulphur Oxidized Finishes.

Charles H. Proctor, New York. Hydrogen Pitting of Nickel-plated Deposits; Its Cause and Cure.

A turkey dinner will be served at the banquet and souvenirs, good music and noise-makers will be provided.

COPPER & BRASS RESEARCH ASSOCIATION

HEADQUARTERS, 25 BROADWAY, NEW YORK

The fifth annual meeting of the Copper & Branch Research Association was held on October 15, 1925, at its offices, 25 Broadway, New York City. The following were among those elected members of the board of directors:

John A. Coe, president, The American Brass Company.

F. S. Chase, president, Chase Companies, Inc.

Edward H. Binns, president, C. G. Hussey & Company.

H. J. Rowland, secretary and sales manager, Rome Brass & Copper Company.

Henry F. Bassett, president, Taunton-New Bedford Copper Company.

Carl F. Dietz, president, Bridgeport Brass Company.

B. Goldsmith, president, The National Brass & Copper Company.

E. C. Goss, president, Scovill Manufacturing Company.

U. T. Hungerford, chairman of the board, U. T. Hungerford Brass & Copper Company.

William Loeb, vice-president, American Smelting & Refining Company.

A. B. Seelig, manager, Michigan Copper & Brass Company.

At a meeting of the board of directors, the following officers were elected: President, R. L. Agassiz; vice-presidents, C. F. Kelley, F. S. Chase, Walter Douglas, H. J. Rowland, U. T. Hungerford; treasurer, Stephen Birch; secretary, George A. Sloan; manager, William A. Willis.

During the year three new companies were added to the membership of the association:

The New Jersey Wire Cloth Company.

The New Haven Copper Company.

Magma Copper Company.

NATIONAL FOUNDERS ASSOCIATION

HEADQUARTERS, 29 SOUTH LA SALLE STREET, CHICAGO, ILL.

The Twenty-ninth Annual Convention of the National Founders Association will be held at the Hotel Astor, New York, November 18-19, 1925. William H. Barr, of Buffalo, is president.

Among the reports and addresses will be the following:

The regular convention dinner will be held at Hotel Astor, Wednesday evening, November 18th, at seven o'clock. It is open to members of the Association and their guests. Tickets may be purchased from the secretary.

Report of Committee on Industrial Education: L. W. Olsen, Ohio Brass Company, chairman.

"The Need for Improved Foundry Methods to Overcome Foundry Labor Shortage": H. M. Lane, President, The H. M. Lane Company, Detroit, Michigan.

"Industry and the Public Schools": L. A. Hartley, Director of Education, National Founders Association.

Convention Dates

Administrative Council, executive meeting—Tuesday, November 17th, 10 o'clock.

Alumni Dinner—Tuesday evening, November 17th, 7 o'clock.

Convention Dinner—Wednesday evening, November 18th, 7 o'clock.

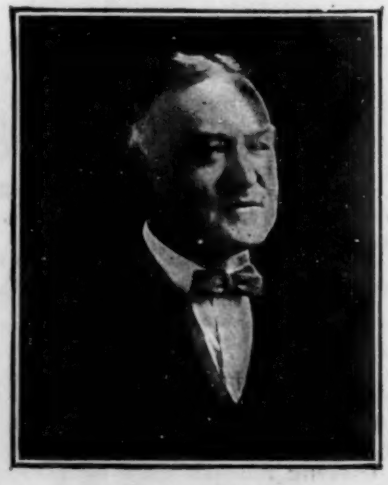
Personals

JOHN H. FEELEY

John H. Feeley, the newly elected second vice-president of the American Electro Platers Society, and recent chairman of the committee responsible for the success of the 1925 convention, was born in Wallingford, Conn., on October 21, 1876. At the age of five he went to Canada with his parents. His father, John H. Feeley, Sr., was the first superintendent of the Canadian Branch of Simpson Hall Millar Company. He was connected with this firm for thirty-two years.

At the age of twelve, John H. Feeley, Jr., entered the employ of Simpson Hall Millar Company as a messenger. He remained with this firm for thirteen years, advancing step by step through the different departments until he had entered the soldering department where he remained for seven years. In 1900 he started in business for himself, in a small way, making a specialty of repairing and replating silverware for hotels.

This business, like others, had its ups and downs until about 1907, when Mr. Feeley's workshop was completely destroyed by fire. This unfortunate occurrence forced him out of business, but during the short period of time in which he was in business he had become known as an efficient workman. The Canadian



JOHN H. FEELEY

Pacific Railway had built an up-to-date repairing and plating department and placed him in charge. For six years he retained this position, looking after the silverware of eighteen hotels belonging to this company and also their dining car department.

In the year 1913 Mr. Feeley reopened a business for himself. This time he had the work of some of the largest Canadian hotels and steamship companies. In 1918 he again took charge of the repairing and plating of the sil-

verware of the Canadian Pacific Railway, but he did this in his own plant. Last year after many requests from private individuals he finally undertook to do the silverware of the home.

Mr. Feeley is possibly one of the platers who maintains that quality is what is going to build up a business. With him are his three sons, who are being trained along these principles.

In speaking to Mr. Feeley concerning the value of the American Electro Platers Society he says that in his opinion it is invaluable. He feels that every plater and in fact every firm having a plater should see that he was a member of this society. No doubt, he says, there are many good platers who do not belong to the society. He questions, however, if any good man outside of this society would not profit considerably by joining.

CHARLES H. BUCHANAN

Charles H. Buchanan, who was for many years connected with the Ely Anode & Supply Company, and who resigned about two years ago, due to ill health, has re-joined that organization and will represent them in connection with their sales service work. The Ely Anode & Supply Company is now located in New York with works at New Haven, Conn.

Mr. Buchanan is one of the pioneer platers of the United States and is known to be one of the best-informed, practical anode experts. He has written a number of articles for THE METAL INDUSTRY, among them being his articles on Early Days in the Electro-Plating Industry, published in June and July, 1923, in which he traced the nickel plating industry from 1870 to the present day, noting the various inventions of equipment and the new types of solution developed. Mr. Buchanan is very popular because of his geniality and his willingness to advise and help platers out of their troubles. He has the good wishes of the entire electro-plating trade.

H. E. MAYNARD

H. E. Maynard has associated himself with the Miner Edgar Company of New York as sales manager of the lacquer department. This company, which is one of the largest manufacturers in the United States of base solutions and solvents, has recently started this department.

Mr. Maynard has had a very interesting rise in the plating and finishing industry. He spent his early days on a farm in Connecticut and, at the age of 17, started with the Davenport Fire Arms Company of Norwich, Conn., to learn the polishing and plating business. After learning this trade thoroughly, he went to New York and took up the manufacture of brass novelties. He rose to the position of general superintendent of the Twisco Novelty Company. Leaving this position, he became salesman for the Celluloid Zapon Company of New York in the lacquer department, remaining with them about four and a half years. He left to assume a better position with Maas & Waldstein Company, also in the lacquer department. He then went with the Anderson Chemical Company of New York as sales manager of the lacquer department, staying with that company until recently.

Mr. Maynard mentions with pride the fact that he is associated with Dr. Walker, who was at one time president and general manager of Maas & Waldstein Company, and who now holds the same office with the Miner Edgar Company.

G. M. Fritch, who recently resigned from the American Brass Company to accept a position with the Dallas Brass & Copper Company, Chicago, as assistant to the president, has been elected a director of the latter company.

W. H. Bennett, formerly with the Jenkins Bros., Ltd., Montreal, Canada, valve manufacturers, is now connected with the Thomas MacAvity Company, Ltd., St. Johns, N. B., Canada, in the capacity of brass foundry superintendent. Mr. Bennett assumed his new position October 1, 1925.

Elmer H. Flinn, who has been associated with Alloy Metal Wire Company, Moore, Pa., for the past five years in various capacities, has been elected treasurer and general manager, succeeding M. L. Murray, who resigned September 17, 1925. Mr. Flinn has been assistant manager for the past year.

Dick Collings, who began his connection with the plumbing trade through the Cleveland Faucet Company where he took a course of training in the shops back in the 90's, has recently joined the sales force of the Bridgeport Brass Company to cover the Michigan, Buffalo, Ohio and Pittsburgh territories. His friends and acquaintances in those territories will remember him as formerly traveling for both the American Pin Company and Ireland & Matthews. Mr. Collings' familiarity with all the items of the prominent plumbing lines on the market, as well as an intimate knowledge of the requirements of the various city plumbing codes involved, will make him a good adviser on merchandising and marketing problems to the trade.

Albert Walton, the newly elected president and general manager of the J. W. Paxson Company, Philadelphia, Pa., has been connected with the metal industries for many years—originally with the Pencoyd Iron Works and later, for six years, with the United States Steel Corporation, as an accounting and operating expert. For several years he was actively employed in various executive capacities with Fairbanks, Morse & Company, Chicago, Ill., and with M. Rumely Company, LaPorte, Ind., tractor and implement manufacturers. During the war, he was employed as organization expert at the Remington Arms Company, Eddystone, Pa., and was also a field aide for the Naval Consulting Board. His other important activities have embraced important re-organization work with Henry Disston & Sons, Philadelphia; The Enterprise Manufacturing Company, Philadelphia, of which he was vice-president, in charge of manufacturing, and with other well known concerns.

On October 1st several friends gathered at a dinner party to surprise **H. J. Richards** and wish him many happy returns of the day. "Hedley," as he is known to his many friends, was somewhat flustered when many kind words were said about him, and messages from Hollywood, Calif.; Wichita, Kans.; Toronto, Can.; Rochester, N. Y.; Dayton and Cleveland, Ohio; Chicago and Belleville, Ill., were read. Among those gahered were some fellow members of the American Electro-Platers' Society. Some were business associates and some were companions in golf and pool, his favorite pastimes. His unselfish attitude toward others, his kind acts and words and even his original poems were mentioned in the toasts to his honor; also some of the pranks he has put over, for it was far from being a post mortem. When Hedley recovered from the embarrassment, of course, he made his usual fluent and interesting speech. Mr. Richards is connected with Lasalco, Inc., of St. Louis, Mo., manufacturers of plating supplies.

Obituaries

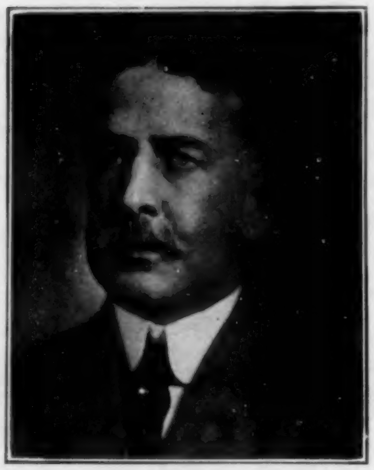
RAIMOND DUY FOSTER

Mr. Raimond Duy Foster, for many years vice-president of the Hanson & Van Winkle Company and dean of the electroplating industry, who died on August 6, 1925, was born in Newark, N. J., on August 6, 1859, the son of John Y. and Cornelia M. Foster.

Mr. Foster's father was a man of great literary ability, and a man of power and influence in both the political and social world of his day—not only in his own city and state, but in the country at large.

In his home such men as Dr. McCosh of Princeton, George William Curtis, Edmund Clarence Stedman, Richard Watson Gilder, Garret A. Hobart, Benjamin Harrison, Governor Marcus L. Ward, John L. Griggs, Mrs. Maud Ballington Booth, and others of the same character, were visitors. It is perhaps due to this fact that Mr. Foster's first position after his education was finished (at Newark Academy and the Pingry School, Elizabeth) was upon his father's paper—the Newark "Morning Courier."

But practical business proved more atractive, and he went with the house of F. A. Potts, coal merchant of New York.



RAIMOND DUY FOSTER

It was, however, with the Hanson & Van Winkle Company that he made his greatest success, holding in turn the positions of bookkeeper, treasurer and vice-president. He was chosen as the first president of the association formed by the industry during the late war.

During Mr. Foster's connection with the company he saw it advance from a comparatively local concern to one of worldwide prominence. To this result Mr. Foster's wide vision, good judgment, and ability to see and use new avenues of usefulness contributed much. He gave thirty-three of the best years of his life in the service of the Hanson & Van Winkle Company and was for many years a dominant factor.

Resigning from active connections with the routine of the business in February of this year, he retained the position of director and financial adviser, in which work he took an active interest practically to the day of his death.

He was a member of numerous clubs, among them the Triton Boat Club, the Union Club, Newark Athletic Club and the Drug Club.

His loss is a heavy one, not only to the organization in the management of which he took an active interest for so many years, but to a host of personal friends and to the electroplating industry as a whole.

EDWIN E. SMEETH

Edwin E. Smeeth, whose death was announced in this journal for October, was born in Chicago, Aug. 30, 1862. His father, Edward Smeeth, had started in business in 1853, doing a miscellaneous business that included, among other things, sheet copper work. Edwin E. Smeeth entered the business about 1880, when it consisted of sheet copper and a brass foundry. In 1895 Edwin E. Smeeth bought the Scott patent on a copper cooling plate for blast furnaces, and gradually worked out of the brass foundry into the line of copper and bronze blast furnace castings. He had charge of the business at the age of 19, his father having died.

For a short time Mr. Smeeth was in the structural steel business, during which time he built the Borland building on La Salle street in Chicago, the Butterfly Dam near Joliet, and did some bridge work.

For the last several years, Mr. Smeeth specialized exclusively in blast furnace castings. The business is being carried on by his son, Harwood E. Smeeth, who has been in active management for several years.

JOHN FRANCIS BELL

John Francis Bell, formerly of the firm of Bell Brothers, smelters and refiners, passed away at his home in Fairmount avenue, Pittsburgh, Pa., Sunday evening, September 20, 1925, after an illness of several months. He was born in Pittsburgh, Pa., being the eldest son of the late Andrew R. and Anne Mullin Bell, aged 51 years at the time of his death.

Mr. Bell was well and favorably known among the metal business dealers of his district, having been engaged in the metal business for thirty wears in Pittsburgh, Pa. In the year 1899 he and his brother, Albert J. Bell, formed a partnership, known under the firm name of A. J. Bell and Brother, this operating name was changed to the firm name of Bell Brothers, when in 1905 another brother, Andrew W. Bell, became associated with the firm. In 1913 John F. Bell retired from the firm and went to Virginia to farm. In 1918 he returned to Pittsburgh and was made general superintendent of the plant of Bell Brothers, which position he held until the time of his death.

Hs is survived by his widow Kathryn M. Bell, two brothers, Albert J. Bell and Andrew W. Bell, his sister, Mrs. A. L. Merz. His loss is deeply mourned not only by his immediate family, but by his hosts of friends.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

NEW ENGLAND STATES

WATERBURY, CONN.

NOVEMBER 2, 1925

Industrial conditions in Waterbury are good with a slight shortage of common labor evident according to the Industrial Employment bulletin of the Department of Labor, issued last month. The special survey for Waterbury says:

"A slight shortage of common labor is reported. All plants are running practically full time and an overtime schedule continues in effect in most of the brass and tube mills. Plenty of building tradesmen are available for the demand. There is no farm labor problem." The report states there has been a "decided improvement" in industrial employment conditions throughout the principal cities of the state.

John A. Coe, president of the **American Brass Company; Frederick S. Chase,** president of the Chase companies, both of this city, and **C. F. Kelley,** president of the Anaconda Copper Mining Company, were elected directors of the **Copper and Brass Research Association** at its offices in New York, last month. They are also members of the executive committee. The election took place at the fifth annual meeting of the Copper and Brass Research Association.

The **Scovill Manufacturing Company** had a noteworthy exhibit at the Milwaukee Metal Exposition. The company's manufactures were displayed, including copper and brass and allied products in the form of cap and machine screws, vanity cases, variable condensers, radio parts, metal bosses and containers, buttons, thimbles, fasteners, automobile parts, radiator valves, electrical parts, plumbing supplies, electrical fixtures, toilet pins, together with a full line of brass mill products such as sheet, rod, tube and wire.

Practicaly all the local brass concerns and other factories are planning to send representatives to the New England conference to be held in Worcester, November 12-13, 1925. This conference has been created at the instance of the New England governors with the object of promoting the interests of the industries of the six New England states and the section as a whole. It is in answer to the demand for a number of years for a medium through which the section could express itself as a unit on questions of legislation, transportation, commerce and agriculture, and is instead of a New England Chamber of Commerce which has been frequently advocated.

E. W. Goss of the **Scovill Manufacturing Company,** who represents Gov. John H. Trumbull of Connecticut in the Congress of New Enland Governors which has been considering plans to improve the coal situation in this section, has issued an appeal to the people of the state to use bituminous coal rather than anthracite as the solution of the coal shortage. It is merely a question of educating the public to the use of soft coal, he said, as bituminous or semi-bituminous is fully

as satisfactory as anthracite, is far cheaper and is not affected by strikes as is anthracite. The principal reason for its non-use is the prejudice created by the anthracite coal operators and their opposition to the granting of lower transportation rates on this product to this section, he said. The latter has recently been counteracted, he said, by the successful efforts of the New England Congress in securing from the Interstate Commerce Commission lower rates on soft coal into this region.—W. R. B.

BRIDGEPORT, CONN.

NOVEMBER 2, 1925

After evidence in the famous **Bridgeport Brass Company's** certificate of error test suit against the city of Bridgeport had been voluminously presented before Judge John W. Banks in the Superior Court during many hearings and then carried to the Supreme Court on reservations, the brass company, against which the Supreme Court decided every question set before it, moved before Judge John R. Booth of the Superior Court, last month, that the company be given permission to "withdraw" the suit.

Judge Booth, however, denied the motion of withdrawal, holding that the decision of the Supreme Court will be formally entered in favor of the city and that the high court's decision will have the effect of a new law which would be without value in the future if the case is withdrawn. The case grew out of the issuance to the company by a previous city administration of a "certificate of error" reducing the amount of taxes levied against the company. Under the present administration it has been held that this and hundreds of other certificates of error were illegally issued and in consequence the city has forced collection of the taxes previously abated by these certificates. The suit was in protest against this forced collection.

Since then the legislature has passed the so-called "ripper" law, which takes the taxing powers away from the city and lodges them with the state. Under this law the brass company has brought a second suit in which it appeals from the action of the board of relief in denying decreases of assessments about which centered the original suit.

Charles Ellis of Colonial avenue, superintendent of the **Burns-Bassick Manufacturing Company,** has resigned his position to accept a position at Ypsilanti, Mich., as factory superintendent. He is already at his new place and will be joined by his wife and children shortly.

Delmar G. Roos, vice-president and chief engineer of the **Locomobile Company,** has resigned. He has definite plans for the future, but states he is not at liberty to talk about them just now. He came to the Locomobile Company from the General Electrical Company in 1911. He left the company in 1920, going to Europe, and on his return became chief engineer for the Pierce-Arrow Company. When the Locomobile Company was reorganized in 1921 he was made its vice-president in charge of production and engineering.

Seven local inventors were granted patents last month. **Thomas A. Both** received a patent for a push button switch for electric fixtures and assigned it to the **Connecticut Electric Manufacturing Company** of this city. **Frederick Black** received a patent which covered 13 claims on the invention of an ingot mold. **Thomas R. Davis** received a patent on a method of producing cast metal wheels. **Benjamin C. Webster,** assignor to the **Columbia Phonograph Company,** received a patent on a device for preventing a door or lid from slamming shut. A transmission brake is the invention for which a patent was granted to **David Blumberg.**

Contracts for a $100,000 addition to the **Remington Typewriter Company's** plant on Railroad avenue have been awarded to the firm of Stewart & Company of New York. Ground will be broken this month and the addition will be ready for occupancy by March. It will be 42 by 60 feet, five stories, of brick and steel construction to blend with the rest of the building. The building is required by the growth of the company's business in the last two years.

Fire of unknown origin, causing about $500 damage and threatening the entire plant of the Locomobile Company, destroyed a two-story wooden structure in the courtyard between two main buildings last month. Quick work by the fire department prevented it from spreading to the other buildings. The fire was discovered by John Gibbons, engineer at the plant, and Herbert Reid, a fireman at the plant.

A committee has been appointed by the **Reciprocity Club,** representing most of the industries and business houses of the city, to investigate plans for making Bridgeport an air port. It is largely the result of the awarding of the government air mail contract for the Boston-New York route to the **Colonial Air Lines** of Naugatuck, and the expectation that mail stops will be made along the route in Connecticut, such as Hartford, Waterbury and Bridgeport. Gov. John H. Trumbull, a director of the Air Lines, has promised the committee his aid and cooperation and that of the state officials.

The education of the manufacturer to a full understanding of his own products, a careful and scientific study of his market and the building up of a smooth sales organization are the methods by which the wide difference in the manufacturing cost of a product and its retail price may be alleviated, **H. G. Crocket** of the **Scoville Wellington,** industrial engineers of New York, told the 400 members of the local branches of the Engineers Club, the Cost Accountants Forum, the American Society of Mechanical Engineers and the American Management Association at their joint meeting last month.—W. R. B.

TORRINGTON, CONN.

NOVEMBER 2, 1925

The **Fitzgerald Manufacturing Company** is erecting a brick addition to its plant in the north end of the city. The addition will be used to house the plating department. It is of brick to conform with the rest of the plant. The company only recently completed a large addition to its original factory building but increase in business called for further expansion. **P. J. Fitzgerald** has returned from a business trip to Europe.

Rapid progress is being made in the erection of the new plant for the **Torrington Specialty Company,** on the Torrington-Winsted road.

William Carroll, aged 64, for over 30 years a foreman of the shape drawing department in the rod mill of the Torrington branch of the Amercan Brass Company, was instantly killed on October 15 in an accident at the factory. A ring attached to a wire stake suspended from a crane hook for transportation suddenly snapped in mid-air, the stake and 1,000 pounds of wire on it falling about 20 feet and striking Mr. Carroll, who was on the floor below.

Major William E. Besse, superintendent of the Torrington branch of the **American Brass Company,** and **Miss Olive Mae Andrews,** were married October 6, at the bridegroom's residence in Torrington.—J. H. T.

PROVIDENCE, R. I.

NOVEMBER 2, 1925

Generally speaking, the business situation and condition in all lines of the metal industries throughout Rhode Island are the best that they have been in many months. Practically every branch of metal activity has shown a material improvement during the past month that is very encouraging because of its apparently healthy character. While there has, for many months, been a hopeful optimism expressed by manufacturers and business men there now seems to be a more material optimism. For the first time in a long period there is a growing scarcity of workmen and in some lines this stringency is the most acute that it has been since the pre-war inflations.

This condition is particularly noticeable in the jewelry branches where, for the first time in nearly five years, there are now calls being made for help through the medium of the newspaper columns. This is not from isolated instances for in one issue of a local paper the past week more than thirty different jewelry firms' advertisements were noted of help wanted. And the encouraging feature of this is that it includes many of the manufacturers of the better grades of jewelry.

The **General Sheet Metal Works,** 86 Randall street, have the contract for copper and sheet metal work for the new Goldsmith building on Randall street.

Whipple & Campbell Company, refiners, who have been located at 22 Conduit street for several years have recently removed their plant and offices to 11 Mason street.

Gilbert Brown, Inc., dealers in electro-platers' and jewelers' chemicals and supplies, 44 Washington street, Providence, has changed its firm name to Gilbreth Brown, Inc.

John F. Brady, Inc., has just installed a number of new pieces of electro-plating equipment of the most modern design at the plant, 71 Friendship street, Providence.

Siranoush Mesrobian and Sarkis Chatalian have recently started in a general enameling business at 25 Calender street, Providence, under the firm style of the **S & M Enameling Company.**

W. H. Coe Manufacturing Company, manufacturers of gold leaf, have commenced the erection of a two-story brick building, 65 by 90 feet, at the corner of Clifford and Ship streets, to be used for workshop and office purposes.

Brass Products Corporation, to be located at Providence, has been granted a charter under the laws of Rhode Island for the purpose of dealing in metal novelties with a capital stock of $50,000. The incorporators are James E. Sweeney and William B. Sweeney of Providence and Adolph Gorman of Warwick.

An added course in this winter's series of extension lectures at Brown University will be given for the special benefit of electroplaters and all others interested in this subject. The lecturer will be **Dr. E. K. Strachen** of the University, department of chemistry, and his subject will be "Chemistry for Electroplaters." The course is the result of co-operation between the authorities of Brown University and the Providence-Attleboro Branch of the American Electroplaters' Society, and is in conformity not only with the society's policy of advancement but with the desire of the University authorities to be of service to the community whenever and wherever possible. The lectures will be given every Monday evening at 8 o'clock and Dr. Strachen states that the interest already exhibited in the ventures is sufficient to warrant the belief that the course will be not only popular but an unusually profitable one.

LeRoy Clark was elected president of the **Phillips Wire Company** of Pawtucket, manufacturers of bare and insulated wire, at a recent meeting of the directors. Other officers elected were as follows: Vice-president, Walter F. Field; treasurer, Frank E. George; secretary and assistant treasurer, O. T. Sherman. The board of directors was increased and now includes the following: LeRoy Clark, Walter F. Field, Walter Robbins and Albert M. Read. Mr. Read of Pawtucket will represent the local stockholders, it is stated. The Phillips Wire Company, although now under the control of the Safety **Cable Company** of New York, will be operated as heretofore under its own name and with the same organization, it is announced.—W. H. M.

MIDDLE ATLANTIC STATES

ROCHESTER, N. Y.

NOVEMBER 2, 1925

Little change is noted in Rochester when business in the metal trades is considered. With the advent of the fall season in September industry appeared to have received considerable stimulation. In fact officials of the various metal-using plants about the city were quite unanimous that business had shown much improvement and that the prospects for further gains were most encouraging.

This sentiment still prevails in Rochester, for there has been marked improvement in business conditions here and the industrial output in the big metal-using plants is much larger than at any time since January. But since the first week in October there have been no appreciable gains. However, on looking over unfilled order accounts, it is quite apparent that activities during November promise to show a sharp increase and that the coming winter months will be of a highly prosperous character.

Superintendents of local brass foundries report business is slowly increasing. Usually large building operations in Rochester have been an aid to slackened conditions in the brass industry all summer. In Buffalo it is said that the brass foundry business is much more active than in Rochester, and has been all this year. Foundrymen say no skilled brass worker or metal polisher is out of work in this city or Buffalo. —G. B. E.

TRENTON, N. J.

NOVEMBER 2, 1925

Trenton metal industries report their business on the increase after being dull in some spots and it is believed that there will be no cause for complaint this winter. The **John A. Roebling's Sons Company** is operating overtime in some departments.

Vice Chancellor Buchanan has appointed **John W. Foster,** of this city, as receiver for the **Trenton Patent Manufacturing Company.** The company, which manufactures lightweight automobile pistons, consented to the receivership. The company is indebted on promissory notes to the extent of $84,570 with accounts payable of $6,521. It has $224,950 in capital stock outstanding of a total issue of $260,000. Bayard L. Dunkle, secretary of the company, is a creditor to the extent of $42,640 for money advanced.

Albert E. Schoeller, president of the **Trenton Heating and Plumbing Company,** has purchased the controlling interest of the firm of Andrew T. Van Cleve, Inc., of Asbury, Park, N. J.

Vice Chancellor Backes has named State Banking and Insurance Commissioner Edward Maxson receiver for the **Chemical Company,** of Springfield, N. J. The bill of complaint was filed by John W. Orelup, of East Orange, N. J., a creditor to the extent of $2,225.

H. M. Royal, Inc., of Trenton, has been incorporated for the purpose of manufacturing chemicals. Horace M. Royal, Edward L. Royal and William T. Malone, Jr., all of Trenton, are the incorporators.

The **Garod Corporation,** radio receiver manufacturers, formerly of Newark, has taken over the plant of the Eck-**Dynamo Company,** Belleville, N. J. The plant comprises two three-story buildings.

Commercial Auto Hardware Company, Newark, N. J., has been chartered with $125,000 capital.—C. A. L.

PITTSBURGH, PA.

NOVEMBER 2, 1925

Slight improvement continues in the metal industries throughout western Pennsylvania. Hardware is in fair demand, and seasonable holiday lines are improving. Radio supplies are showing a much stronger demand. Electrical lines are active, and the largest local manufacturer report orders for the quarter ending September 30, totaling over $43,000,000, which was about 25 per cent better than a year ago. Sanitary goods manufacturers are very busy, and demand continues steady.

Plants of the **Kelly & Jones Company,** in Etna and Greensburg, Pa., and other assets of the company, at 135 Water street, Pittsburgh, will not be turned over to the Walworth **Manufacturing Company,** of Boston, probably until the latter part of this month, in conformity with a sale agreement between the boards of directors of these two companies, it was declared by James Balph, attorney for the Kelly & Jones Company, when questioned concerning reports that the plants were turned over to the purchaser on October 1, 1925.

The Walworth company recently underwent some new financing to care for its merger plans. In addition to the purchase of Kelly & Jones, the company has secured 74 per cent of the stock of the Mark-Lally Company and will make a greater bid for world markets in valve, hardware and steam-fitting supplies. Sales are expected to run between $35,000,000 and $45,000,000 per year, according to Howard Coonley, president of the Walworth company. No changes in management of local plants are said to be planned.—H. W. R.

MIDDLE WESTERN STATES

CLEVELAND, OHIO

NOVEMBER 2, 1925

Employment conditions in all industries in the Cleveland area show a marked improvement over prevailing conditions at the same time in 1924. According to the report of a local industrial organization, the demand for workers this fall is 50 per cent greater than a year ago. In its monthly report the American Plan Association states that the demand for foundry workers, molders, polishers and toolmakers has increased more than the demand in other trades.

Eighteen committees of the American Society for Testing Materials met in Hotel Cleveland, October 27 to 29, inclusive. Engineers and plant executives, numbering 250, were present. They made surveys in the standardization of specifications and methods of testing metals and machinery. **Prof. H. M. Boylston**, Case School of Applied Science, Cleveland, is chairman of the committee on heat treating. The society has 3,800 members. Twenty-five years ago, Americans interested in testing belonged to the International Society for Testing Materials, a European organization. Later an American chapter was formed and finally an American society. During the war the European society was abolished and now many engineers abroad belong to the American organization.

A recent meeting of stockholders of the **Perfection Stove Company**, Cleveland, approved changing the firm name to the **Cleveland Metal Products Company**.

Engineers from all parts of Ohio and adjacent states early in October visited the plant of the **Lincoln Electric Company**, Coit road, Cleveland. Open house was held to give engineers an idea of the use of electric arc welding in the manufacture of motors and welders, which the company produces.

Production from the molding sand quarries at New Lexington, Ohio, reached a peak last month, when an average shipment of 30 carloads daily was maintained. Half of the output for the month was consigned to the River Rouge foundry of the **Ford Motor Company**.

Myron T. Herrick, Cleveland, Ambassador to France, has been elected honorary chairman of the **Union Carbide & Carbon Corporation** of New York. Mr. Herrick has been active chairman since November, 1917.

Recent tests by the government have established a high tensile strength for two alloys known as "Silvulloy" and "Alluloy," discovered by **J. J. Salm**, proprietor of the **Hawk Metal Company**, Akron, Ohio. A large order has been placed by the government. That, together with a general increase in business, made it necessary for the company to open a branch at Miami and Thornton streets, last Monday. The original plant at 81 W. Exchange street was established in 1919.—S. D. I.

DETROIT, MICH.

NOVEMBER 2, 1925

The general condition of the brass, copper, aluminum and gray iron industry here continues in about same condition as it was a month ago—all plants operating to capacity and some even more than that, in order to keep up with production demands. The present year will go out as one of the best industrial periods in history of this territory. Many plants are planning improvements and expansions and a number already have started improving their facilities.

The **Capitol Chandelier Company** has recently been incorporated in Detroit, for the purpose of manufacturing and dealing in electric lighting fixtures. The owners are David Polk, Herman Polk and Albert S. Polk, 1662 Hazelwood avenue, Detroit.

The **Royal Bronze Company** is the name of a new concern just incorporated in Detroit, with a capital stock of $10,000, for the purpose of dealing in electric fixtures. The stock holders are J. Harvey Margolis, Fay Dobrin and Jennie Steinberg, 7458 Twelfth street, Detroit.

The **Bohn Aluminum & Brass Corporation** has recently let a general contract to C. H. Reisdorf, of Detroit, for an extensive foundry addition.

The Battle Creek, Mich., Chamber of Commerce, announces the establishment in that city of the **Burns Brass Foundry**, together with three other new concernes engaged in different lines.

The **Mueller Brass Company** at Port Huron has acquired insurance protection for its 663 employes. The policy provides $500 protection for women and $1,000 for men. Employes pay part and the company the remainder of the premium.

Lester G. Auberlin, for many years purchasing agent for the **Pemberthy Injector Company**, Detroit, is now executive secretary of the Purchasing Agents' Association of Detroit. He is widely known among the industrial plants of the city with whom he has been in close contact for a long time. With his new duties he also becomes editor of the "Detroit Purchaser," a monthly publication issued by this association.

The **Edmund & Jones Corporation** declared a quarterly dividend on October 1 of 75 cents on its common stock and its regular quarterly dividend of 1¾ per cent on its preferred. This company paid an extra dividend of 50 cents on the common on July 25.

H. H. Landay, president of **H. H. Landay & Company**, Book building, Detroit, announces an enlarged and more efficient coke department to deal exclusively in by-product and beehive coke, suitable for brass, aluminum and other metal melting.—F. J. H.

CHICAGO, ILL.

NOVEMBER 2, 1925

Officials of 140 local associations of credit men will meet in Chicago October 26-31 for a five-day conference. Monday and Tuesday will be given over to a discussion of credit interchange work, by which the associations keep a definite account of the paying records of firms doing business with thousands.

The corporation earnings of the **American Metal Company** for the third quarter were equal to $2.80 a share earned in the first six months, or nearly $6 a share for the nine minths' period.

The **Chicago Tel Vision Company**, 5966 Chicago avenue, has recently been incorporated with 10,000 shares of no par value to perfect the development of process, apparatus and machine for transmission over long distance of radio. This manufactured product will be known as R-Tel Vision. The incorporators are: Walter A. Code, Adolph Fiffer, Edmun W. Code, W. J. McGuinness and Ben Gluck. W. J. McGuinness, 748-N Conway Building, is the correspondent.

The **H. and S. Radio Company**, 1230 Wilson avenue, recently incorporated for the capital of $15,000. They will buy, sell, manufacture and deal in radio apparatus, equipment and appliances. The incorporators are R. C. Higgins, Cortiss W. Catrone, and John M. Vanbrunt, Jr. J. B. Vanbrunt, 1503 Burnham building, is the correspondent.

The **Restaurant Supply Company**, 665 South State street, has been incorporated recently with a capital stock of $25,000. Abram Z. Zeitlein is the correspondent, and the incorporators are, Louis Perlman, Sam Horwitz and Morris Perlman. They will buy, sell, exchange and manufacture kitchen utensils, and other restaurant hardware.

The **Davis Industries**, 5148 S. Michigan agenue, has been organized and incorporated for a capital of $1,250,000. They are to manufacture and deal in metal and wooden products, and utensils; also musical instruments and records. Meyer Davis, Harry Davis and David Davis are the incorporators, with Henry J. and Charles Aaron, 76 W. Monroe street, the correspondents.

The **Radio Essentials Corporation**, 4829 South Kedzie street, is a newly formed corporation, with a capital stock of $50,000. They will deal in and manufacture radio parts and accessories, etc. The incorporators include Dudley W. Lester, Joseph C. Nector and Cornelius R. Palmer. Maurice J. Moriarity, 806 New York Life building, is the correspondent.

At the directors meeting of **Foote Brothers, Gear and Machine Company**, reports of good consistent business were recorded. No dividends were declared, since these were given for the full year early in the year.—L. H. G.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND,

October 19, 1925.

Some little expansion is reported in the Birmingham metal industries. The copper tube trade has been assisted by a fairly large order for locomotive tubes for an Indian railway divided between half a dozen Birmingham concerns. These trades have suffered somewhat by the increasing use of steel in tubular boilers. The silver and electroplate trades are busier, the work in hand comparing very favorably with that of a year ago, a good deal of new machinery has been installed in order to speed up production.

The trade in aluminum hollow-ware is fairly active, and the briskness of the motor business has led to increased consumption of aluminum sheets. The makers of hollow-ware in this metal have for some time been bringing pressure to bear upon the government to apply the Safeguarding of Industries Act by means of a tariff to restrict the importation of cheap foreign ware especially from Germany. The appeals have so far succeeded as to elicit from the department an invitation to the manufacturers to present formal evidence so that the claim to a tariff may be considered.

The jewelry trade is getting some of the usual autumn activity, fairly substantial orders having come in from dealers preparing their Christmas stocks. The signs are that the season will be as satisfactory as usual although the general tendency is to take a lower quality of article than was formerly sought by the public.

The change over from lead to copper tubes for water conveyance proceeds rather slowly. The greatest enterprise is shown by municipal builders to whom the first cost is a matter of less importance than to private builders. In many instances the old fashioned lead pipe is preferred by those who are obliged to count the cost. Activity continues in the plumbing brass department and everything connected with domestic lighting is tolerably active. Birmingham makers of pens and a variety of small brass wares cater in an increasing degree for wireless fittings, and some hundreds of varieties of these are being produced by stampers of metals, the machinery for this being readily adaptable.—J. H.

Business Items—Verified

The **Ferro Enamel Supply Company,** of Cleveland, Ohio, is installing two large Alundum enameling furnaces for the **National Stove Company,** Lorain, Ohio.

The **Hardinge Company,** New York, announces the receipt of orders for 49 Hardinge mills. A number of these mills will be installed in industrial plants working with metals and other lines.

Charles F. Hacker, 211 Lux street, Rochester, N. Y., is reported in the market for enameling and japanning equipment. This firm operates the following departments: japanning, lacquering.

Abrasive Company has opened a district office in Detroit, at 149 Larned street, East. The office is in charge of W. A. MacFarland, who has long represented the Abrasive Company in the Detroit section.

The **United States Electrical Tool Company** of Cincinnati, Ohio, announces that its products "U. S. Portable Electric Tools" will be serviced by and through Westinghouse service stations located in 28 cities in the States.

The **French Manufacturing Company,** Waterbury, Conn., manufacturer of bronze and copper tubing will proceed with the erection of a one-story power house to cost $30,000. W. E. Hunt, Torrington, Conn., is architect.

The **Buck's Stove & Range Company,** of St. Louis, Mo., recently relined one of its enameling furnaces with a Norton Alundum Muffle. The Karr Range company, of Belleville, Ill., is also installing a Norton Alundum Muffle.

The **Brown Instrument Company,** Philadelphia, Pa., announces the opening of the following offices: Indianapolis, Ind., 215 East New York street—J. R. Green, in charge; Cleveland, Ohio, Room No. 1108 Hipprodrome building—G. S. Frazee, in charge.

The **Acme Stamping and Brass Works,** Zeeland, Mich., manufacturers of automobile brass fittings, toilet seat hinges, forgings and stampings have plans for a new plant 110 x 126 feet. Their capital is being increased from $12,000 to $50,000. John A. Donia is president.

The **Mansfield Vitreous Enameling Company,** of Mansfield, Ohio, is enlarging its plant, adding two large Alundum furnaces, with double fork and Unloaders, Automatic Dryers, etc. Equipment is being installed by the Ferro Enamel Supply Company, of Cleveland, Ohio.

Hoffman Heater Company, Louisville, Ky., is contemplating the addition of a small brass foundry and will require complete equipment. R. C. Huddle is purchasing agent. This firm operates the following departments: brass foundry, brass machine shop, tool room, japanning.

Elgin Clock Company, National street, Elgin, Ill., asked bids early in October, for a one and two-story addition, 65 x 300 ft., to cost $150,000, including equipment. This firm operates the following departments: brass machine shop, tool room, plating, japanning, stamping, polishing, lacquering.

Bridgeport Safety Emery Wheel Company, Bridgeport, Conn., announces that it has appointed Manning, Maxwell & Moore, Inc., as national distributor of the Bridgeport line of grinding and polishing machinery. The Bridgeport Safety Emery Wheel Company will continue to market direct its sectional grinding wheel chucks and grinding wheels.

General Etching & Manufacturing Company, 312 South avenue, Chicago, Ill., manufacturer of etched metal products, has acquired property at 3070-82 West Grand avenue, totalling about 46,000 sq. ft., and has plans under way for a new one-story plant to occupy the entire tract, estimated to cost $100,000 with equipment. Frederick Lubin is president. This firm operates the following departments: cutting-up shop, plating, jappaning, stamping, polishing, lacquering.

Walworth Company, Boston, Mass., has purchased the assets of the **Kelly & Jones Company.** The Greensburg and Etna plants of the latter will be operated as the Kelly & Jones division of the Walworth Company, while the merchandising of the Kelly & Jones product will be handled by a new Kelly & Jones Company of which Prentiss L. Coonley is president and James S. Mattimore, formerly vice-president of the old Kelly & Jones Company, is vice-president. The latter will have their headquarters in New York City.

P. R. Pratt Manufacturing Company, Deep River, Conn., recently organized, has purchased the plant and business of the Potter-Snell Novelty Works, manufacturer of wire and metal goods, consisting of a two-story factory, 30 x 100 ft., with one-story machine shop adjoining, 40 x 120 ft. The new company will continue production and plans expansion. It is headed by Philip R. Pratt, heretofore connected with the acquired company. This firm operates the following departments: plating, stamping, polishing, swaging, knurling.

The **Miner Edgar Company** of New York, who for the past ten years have been manufacturers of base solutions and solvents for lacquer manufacturers, have opened a new department. Dr. Henry V. Walker, the well known lacquer expert, has associated himself with this company in the capacity of president and general manager, and they have entered into the manufacture of a complete line of lacquers and lacquer enamels for metal, wood and composition articles. This company will make a specialty of supplying the automotive trades.

Extensive additions to the productive facilities of the **Somerville Stove Works,** Somerville, N. J., have just been completed. These consist of a new gas range and combination range mounting department, press and die department, welding department, drilling department, japanning and enameling plant, testing equipment, pattern shop, pattern storage warehouse, finished goods warehouse, crating and shipping department, exhibition rooms and also new business offices. The new buildings contain over 60,000 square feet of floor space.

Public financing by the **American Type Founders Company,** New York, was effected in the offering by Lazard

Freres and Lehman Brothers of a new issue of $5,000,000 fifteen-year 6 per cent sinking fund gold debentures at a price of 100 and interest to yield 6 per cent. The American Type Founders Company, founded in 1892, is not only the largest manufacturer of type but is the largest dealer in printers' equipment, materials and supplies in the United States. Its manufacturing plant in Jersey City is the largest type founding plant in the world.

The **Robert June Engineering Management Organization,** of Detroit, Mich., has acquired control of the Electric Flow Meter Company, at Kansas City, Mo., formerly the Hyperbo-Electric Flow Meter Company, of Chicago, and will henceforth operate the business under its own management, with executive offices at 8835 Linwood avenue, Detroit, Mich. Robert June becomes president of the company, J. M. Naiman, formerly general manager becomes vice-president, consulting and chief engineer, with Major W. W. Burden, of the Robert June Organization, as treasurer.

LASALCO BUYS BENNETT-O'CONNELL

Lasalco, Inc., St. Louis, Mo., have purchased from the Union Trust Company, Chicago, Ill., receiver, the right, title and interest in and to the good will of the Bennett-O'Connell Company, Chicago, Ill., including all patents, formulas, copyrights, jigs, dies, drawings, patterns, etc., and will as successors to the Bennett-O'Connell Company, continue to manufacture and sell their well known products on the market for the past thirty years, including Excell-All generators, polishing lathes, mascot compositions, etc. Lasalco, Inc., was organized in January, 1919. Officers are: F. E. Terrio, president and treasurer; H. J. Richards, vice-president; and L. Freihaut, secretary. They manufacture the Richards Rotary Plater, also the Lasalco brand of buffs, polishing wheels and compositions and are direct sales agents, covering a wide territory for some of the foremost manufacturers of other equipment and supplies.

INCORPORATIONS

The **Safety Cable Company,** Bayonne, N. J., has been organized to take over and consolidate the **Safety Insulated Wire & Cable Company,** of that city, and the **Phillips Wire Company,** Pawtucket, R. I. The two plants will have a combined floor area of 550,000 sq. ft., and will be continued in operation. The new company has arranged for a stock issue of $6,250,000, the proceeds to be used for the consolidation and for proposed expansion. **LeRoy Clark** is president of the consolidation.

Joseph W. Buckley and **Fred W. Enzenbacher,** formerly of the **Buckley Foundry Company** of Roseland Street, Springfield, Mass., have formed a new partnership concern called the **National Bronze Company,** and have leased a portion of the foundry formerly operated by the **Harley Company,** in Page Boulevard, where the production of bronze, brass and aluminum castings has been commenced on substantially the same lines as carried on by the Harley Company for years. About 20,000 square feet is being put in shape for operations.

W. C. Gilmore Corporation, 216 North 6th street, Waco, Tex., has been organized to manufacture acetylene gas generators, fixtures, coolers, etc. It has a factory and is in the market for materials, including galvanized sheets, pipe, fittings, stove bolts, brass springs, solders, brass castings and other items.

BUSINESS TROUBLES

American Bronze Corporation, Berwyn, Pa., was sold at sheriff's sale on August 28, 1925, and at that time the plant was bought by new interests who control ample working capital and propose to operate the business on the same basis as heretofore. At the present time the complete organization is not settled, but in the meantime the plant is running at full capacity and in a position to take care of all business coming in.

METAL FATIGUE TESTING

According to Alfred D. Flinn, director of the Engineering Foundation, a great deal of work is being done in the United States in the investigation of fatigue of metals.

"One outstanding result of these investigations is the establishment on fairly firm grounds of the existence of limiting stresses for most metals below which they can be stressed an indefinitely large number of times without failure. To this limiting stress the name 'endurance limit' or 'fatigue limit' has been given.

"Fatigue tests, in the main, have consisted of repetitions of bending or pulling and compressing or twisting on a series of specimens of each kind of metal at each of a number of intensities of stress or amount of load. The first test of each series was made at a high stress and successive tests at lower stresses. Each test as a rule was run without interruption until the specimen broke.

"To establish the existence of the fatigue limit it has been necessary to make thousands of tests, many of them involving 100,000,000 reversals of stress at rates of about 1,500 revolutions per minute. Two tests at least were continued for 400 days and nights, reaching a total of 1,000,000,000 reversals."—New York Times.

DEFORMATION OF MOLDING SANDS

Experiments to devise a method for running softening temperature determinations on molding sands have been conducted by the Bureau of Mines, Department of Commerce, at the request of the committee on molding sands of the American Foundrymen's Association. Experiments have been completed and a report to the committee is being prepared for its guidance in formulating the conditions under which molding sands should be tested for refractoriness. In this work it has been necessary to determine first the effect of furnace atmospheres on the raw sand, the washed sand, and the bond used in forming the sand into molds. Six typical sands were selected and these were tested under both oxidizing and reducing conditions. The softening range of the sand was determined on cones and test bars.

STUDY OF WHITING

A study of the production and utilization of whiting has been undertaken by the Bureau of Mines of the Department of Commerce. W. M. Weigel, mineral technologist, has begun the collection and tabulation of available published information and has established contact with domestic producers of whiting.

METAL MEN IN RED CROSS

The Metals & Machinery trades have been practically organized for the Ninth Annual Roll Call of the American Red Cross which begins on Armistice Day, November 11, 1925. Charles Hayden, of Hayden-Stone Company, will head the Mining, Smelting, Pig Iron and Brass group; Samuel B. Donnelly, Secretary, Allied Metal Industries, the Bronze and Allied Metal Industry; Edward McCormick, Vice-President of Railway Steel Spring Company, the Railroad Supplies group; G. E. Cullinan, Sales Manager, Western Electric Company, Electrical Machinery & Supplies; C. P. Coleman, President, Worthington Pump Company, Boilers Engines and Machinery; L. Keating, J. M. Mossman Company, Hardware and Tools group. A chairman has not yet been appointed for the Sheet Metal industry.

METALS IN THE WRONG PLACE

When an autopsy was performed in Barrow, England, on the body of a man who had evidently committed suicide the following articles were found in his stomach.

Piece of lead piping, two pieces of slate pencil, two pieces of metal boot tips, four nails, two needles, part of a safety pin, pair of small tweezers, piece of glass, collapsible top metal cap and small piece of rubber.—New York Times.

AIR MAIL SERVICE

Means of speedy communication are vital to the business world, and the recent installation of Air Mail Service is the most useful and important measure of postal improvement since the adoption of the railway postal car system in the sixties.

Transmission of mails by air is effected in less than one-half the time required by train. Air Mail letters dispatched from New York today about 9 P. M. are delivered at their address in Chicago by first carrier delivery tomorrow morning; or if forwarded from Chicago by train to other points, will move by the first morning train instead of by a late evening train. The delivery of such letters in postal territory served from Chicago will thus be expedited by at least twelve hours and often much more.

In many business transactions time is of much importance. The Air Mail Service is of great value in all such cases. In the case of such letters, the extra postage charge is negligible.

THE ART OF THE METAL WORKER

As an aid to the appreciation of the Museum's important collections covering the field of the art of the metal worker, a course will be given during the winter of 1925-6 by Dr. Bashford Dean, of the staff of the Metropolitan Museum of Art. These lectures, given under the auspices of New York University, will trace the development of the art of the workers in lead, pewter, brass, copper, silver and gold, iron and steel, devoting special attention to the work of the armorers in the fifteenth and sixteenth centuries. An attempt will be made during thirty afternoon sessions (Wednesdays), by means of lectures, seminars, demonstrations, and laboratory work, to trace the steps in this branch of art on evolutional grounds, where the various "types" of metal work are shown to have their beginning, rise, culmination and decadence. Attention will be given to the means employed by modern students in dating objects, in determining their place of origin, and in detecting forgeries.—Rescript from Bulletin of the Metropolitan Museum of Art for October, 1925.

BRONZE PAYS LARGE DIVIDENDS

Directors of the Superb Bronze and Iron Company, a manufacturing organization operating in Brooklyn, declared a 700 per cent stock dividend October 20, 1925. In connection with the proposed stock dividend distribution, the company recently filed papers in Albany relating to an increase in the capital stock of the company from $25,000 to $200,000, and as a result of this increase stockholders will hold eight shares of new stock in place of one share now being held.

The capital stock of the company has been closely held since its incorporation. Sydney S. Zolotorose is president of the corporation, Louis Birk vice-president and Irving Zolotorose secretary and treasurer. The company, which specializes in bronze fittings for banks and other financial institutions, does a large domestic and export business.—NEW YORK TIMES.

ALUMINUM STOCK SALE

The Union Trust Company of Pittsburgh recently sold 6% accumulative preferred stock of the Aluminum Company of America to the amount of $6,855,500. This stock was the property of Oberlin College, Berea College and the estate of Charles M. Hall, late vice-president of the Aluminum Company of America. According to A. V. Davis, president, the Aluminum Company of America was established in 1888, recapitalized and re-incorporated in July, 1925, and has had a continuously successful history since 1888.

The company has recently acquired a large water power on the Saguenay River in the Province of Quebec, and is constructing there a large aluminum producing plant which it is expected will be in operation in the latter part of 1926.

In addition to this new plant in Quebec, the company, or its subsidiaries, owns and operates plants in East St. Louis, Ill.; Niagara Falls, N. Y.; Massena, N. Y.; Edgewater, N. J.; New Kensington, Pa.; Shawinigan Falls, Quebec; Toronto, Ontario; Badin, N. C., and Alcoa, Tenn. The company owns ample supplies of bauxite in Arkansas, British Guiana, Dutch Guiana and other foreign countries.

The earnings of the Aluminum Company of America (and its subsidiaries) available for payment of dividends for the ten years 1915 to 1924, inclusive, averaged $9,843,133.33 per annum. The earnings available for payment of dividends during the first nine months of 1925, were $13,221,946.61.

Aluminum Company of America consolidated balance sheet of September 30, 1925, shows total assets of $194,647,341.56 of which $64,369,768.90 are current assets, and showing liabilities current and funded of $32,042,720.26.

WORLD ZINC MARKET RISING

The zinc market is progressing along the lines expected and there is every appearance that the metal will soon be selling at over £40 per ton. Indeed, so scarce is the supply of actual metal that there was something of a "bear squeeze" at end of September, and, on the last day for delivery against contracts for that month, dealers who found themselves unable to deliver were forced to settle at a few shillings over £40 per ton of zinc involved. It is significant that some of the dealers who were caught short last month are seizing time by the forelock in respect to October, and have paid the premium demanded for American zinc, and will thus be able to meet their engagements for the current month. There is, however, quite a substantial short account open and this is steadily being closed.

Apart from the United States and to a small extent Germany and Poland, there are no stocks of slab zinc in the true sense of the word and what is shown is practically the constant tonnage on smelters' floors.—From a Report on World Conditions of Zinc as of October 1, 1925, by A. J. M. Sharpe, for the American Zinc Institute.

THE INTERNATIONAL NICKEL COMPANY

COMPARATIVE CONSOLIDATED GENERAL PROFIT AND LOSS STATEMENT

	2nd Quarter Sept. 30, 1925	1st Quarter June 30, 1925
Earnings	$2,123,487.07	$1,893,705.92
Other Income	23,324.72	72,134.40
Total Income	$2,146,811.79	$1,965,840.32
Administration and General Expense	149,290.43	122,131.47
Reserved for Federal and Franchise Taxes	220,951.20	194,794.33
Net Operating Income	$1,776,570.16	$1,648,914.52
Depreciation and Depletion	328,932.13	326,800.84
Orford Works Property and Shut Down Expense*	26,519.81	27,996.43
Profits	$1,421,118.22	$1,294,117.25
Preferred Dividend	133,689.00	133,689.00
Common Dividend	836,692.00	....
Balance	$ 450,737.22	$1,160,428.25

*Insurance, Taxes, etc., and Pensions of Ex-employees.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$ 5	$ 71	$ 74
American Hardware Corporation	25	105	106
Anaconda Copper	50	51⅝	51¾
Bristol Brass	25	5	8
International Nickel, com	25	40	40⅛
International Nickel, pfd	100	100	..
International Silver, com	100	225	235
International Silver, pfd	100	108	112
National Enameling & Stamping	100	35½	37
National Lead Company, com	100	167	169
National Lead Company, pfd	100	116	117
New Jersey Zinc	100	195	199
Rome Brass & Copper	100	130	143
Scovil Manufacturing Company	..	228	238
Yale & Towne Mfg. Company, new	..	61½	65

Corrected by J. K. Rice, Jr., Co., 36 Wall street, New York.

INTERNATIONAL EXPOSITION

The year 1926 will bear witness to 150 years of American Independence and progress. The City of Philadelphia very properly will celebrate the 150th Anniversary of the Signing of the Declaration of Independence by holding the Sesqui-Centennial International Exposition. The exposition will open June 1 and close December 1, 1926.

Plans are being made in a big and attractive way. Millions will be spent for buildings and for the creation of an attractive exposition area with landscape gardening, roads and paths, lagoons and other waterways.

The Philadelphia Chamber of Commerce recognizing that a great responsibility rests upon the Chamber and its membership to make successful industry's exhibition at the Sesqui-Centennial International Exposition, has authorized its president to appoint an Advisory Committee, representative of all of the different industrial activities of Philadelphia. As a member of this Advisory Committee, Karl Legner, vice-president of Haines, Jones & Cadbury Company, Philadelphia, Pa., was asked to serve as chairman of Group 67, comprising plumbing and sanitary materials.

Mr. Legner invites those interested to exhibit their products under Group 67. Information can be obtained from him or from "The Sesqui-Centennial International Exposition, Philadelphia, Independence Square, Philadelphia, Pa."

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

NOVEMBER 2, 1925.

Practically all lines in the metal industry continued to enjoy prosperous conditions during October. The demand for white metal products, such as nickel and monel metal, as well as nickel silver and other copper-nickel alloys, continues on such a large scale and through such widely diversified channels that the mills producing these metals have booked tonnages in excess of their producing capacity, and deliveries are getting slow. This trend to the white metals has attracted the attention of some mills which have heretofore made only the alloys of copper and zinc, and several new nickel alloys have appeared on the market. These are of the nickel-silver variety, but most of them contain a larger percentage of nickel than the regular market grades of nickel-silver.

Several industrial exhibitions held throughout the country during the month indicated, conclusively, the extent to which these white metals were being adopted by various industries. At the Dairy Show in Indinapaolis many new dairy machines were shown, some of them made almost entirely of pure nickel. Much of this nickel was used in parts which were formerly made of enameled steel or glass. One of the largest manufacturers of enameled ware in the country launched a complete line of hospital utensils made of monel metal at the Hospital Show in Louisville. The Ice Cream Show at Detroit was practically a white metal exhibition. Monel metal and nickel-silver were shown to be used almost exclusively, not only on soda fountains and the self-refrigerating ice-cream cabinets but also in the construction of ice-cream-making machinery and equipment.

Throughout practically all lines of manufacturing and construction and down the line from the production engineers to the consuming public, the educational work done in behalf of metals is bearing fruit and the demand for the metals is increasing. This is having a marked effect on the brass and copper business, and all the mills producing these metals are running full. The sheet copper mills all have large tonnages booked, and the demand shows no signs of slackening. Brass and copper sheets, rods, tubes and wire were advanced in price one-quarter cent per pound, and it is regarded as probable that very shortly further advances will be announced. When it is considered that the huge war capacity of the brass and copper mills is almost fully engaged in production, it can be seen that the demand must be greatly in excess of any past requirements in peace times. Destructive competition is less noticeable, with prices on a satisfactory basis, both to producer and consumer. This condition is healthy and not in the nature of a temporary boom, and that the future of the industry was never brighter.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

NOVEMBER 2, 1925.

October movements in copper reflected a fairly active interest in the market on the part of domestic consumers especially. Sales reached substantial proportions, and new demand indicated eminently satisfactory conditions throughout the entire consuming industry of the country. The trend of prices, however, failed to develop a consistently strong tone in keeping with the large-scale operations by American mills.

Market fluctuations were within the range of 14⅜c. and 14¾c. for the electrolytic grade. For a time it appeared that the market was due for a distinct advance into higher ground, but occasional displays of selling pressure at the foreign center were followed by concessions here. Such measures are generally followed by comparative ease in domestic quarters. Industrial requirements continue very great, but despite that fact they do not inspire consistent market firmness.

ZINC

The market for zinc showed a rising price trend during the past month, owing to excellent domestic demand and good foreign buying. The betterment was more pronounced recently, with decided market firmness. A reduction of 5,236 tons in stocks during September gave convincing proof that conditions in the industry were in sound shape. Holdings in smelters' hands have been gradually reduced until the recorded tonnage at the end of September amounted to 11,796 tons. These are the smallest stocks of slab zinc in many months. September deliveries were the largest this year and amounted to 52,620 tons, compared with an output of 47,384 tons. Prompt metal appears scarce and demand has developed for forward shipments. Recent buying of ore was remarkably active. Present prices are quoted at 8.65c. East St. Louis and 8.95c.@9.00c. New York.

TIN

Rising prices and powerful speculative control were recent features in the tin situation. Prominent operators abroad have realized that conditions were especially favorable for bullish activities, and the recent upswing in prices is the result. The market developed a great spurt of strength in October, which lifted the price of Straits tin to 64½c. during the last half of the month. A strong statistical position has furnished an excellent background for staging market movements of unusual possibilities. Consumers have been obliged to submit to circumstances and pay the heavy advance despite the argument that the technical reasons for higher prices were discounted long ago. The view of those best posted in the situation appears to be that tin values are apt to continue at a spectacular level for some time to come. Limited stocks, heavy consumption and powerful control are the factors which the professional manipulator and trader deems ideal for carrying out his program. And the buyer has to pay the piper.

LEAD

With a continued heavy volume of consumption, prices of lead have been remarkably steady lately. Demand is absorbing output at a rate that leaves no troublesome surplus to pull down values. For this reason producers are piling up profits rapidly and with the enthusiasm which splendid earnings produce. Meanwhile consumption holds up strong, and there are plenty of buyers to take up output as it comes along at prevailing figures. Commercial

needs, both here and abroad, has eliminated low prices. With diversified channels of distribution the prospects for continued heavy demand are excellent. Present quotations are 9.75c.@9.85c. New York and 9.25c @9.40c. St. Louis.

ALUMINUM

Increased firmness is the feature in aluminum market. The advance of a cent a pound established by the leading producer a short time ago stimulated buying considerably, and made consumers more eager to secure supplies for future delivery. Remelted material has also advanced, and the entire situation reflects the large operations requiring aluminum. Stocks of imported metal are comparatively small and all sources of supply view the situation as highly favorable from their point. Even the scrap dealers scan the outlook with satisfaction, as they are able to raise their price. Virgin aluminum of 99% plus quotes 29 cents, and 98-99% is 28 cents.

ANTIMONY

In the light of scarcity of supplies and unsettled conditions in China, the market has held up unusually firm. Offerings have been restricted and at stiff prices for both spot material and future shipments. Prompt delivery is hard to get except in small lots and quotes 19½c. duty paid. Shipments from China during October and November sold at 15¾c., but earlier shipments quote 17½c. Holders are confident regarding strong position of the article, and are bent on getting full prices.

QUICKSILVER

The market for quicksilver scored a decided gain recently. Prices are now at highest level in several months, with domestic supplies quoted at $85.50@$86 per flask. Spot supplies are said to be small, although imports are much greater than last year.

PLATINUM

There are indications of firmness in the market and sales were good. Quotations continue at $116@$118 an ounce for refined.

SILVER

Although relatively small changes were noted in the silver markets of New York and London last month, there was substantial activity at frequent periods. China and India have been important buyers, and our own government has purchased regular quantities lately for coinage purposes. China has been both buyer and seller lately. India is especially prosperous and a good demand is expected from that quarter. Domestic stocks are small, and the market is therefore in position to respond to favorable developments.

OLD METALS

Market action in scrap metals is closely related to developments in virgin metal. Copper and brass scrap are especially sensitive to fluctuations in new copper, and with recent uncertain tone in the primary market consumers have restricted operations. Lead moves more freely at good prices. Considerable activity was displayed in zinc scrap and reflected the strong tone for virgin stock. Export buying was not urgent, but better business for foreign account is expected in the next two months. Quotations dealers name are: 11¾c.@12c. for heavy copper, 9½c.@9¾c. for light copper, 7c.@7¼c. for heavy brass, 9¼c.@9½c. for new brass clippings, 7¾c.@8c. for heavy lead, 4¾c.@5c. for old zinc, and 23c.@23½c. for aluminium clippings.

WATERBURY AVERAGE

Lake Copper—Average for 1924, 13.419—January, 1925, 15.125—February, 15.00—March, 14.375—April, 13.625—May, 13.625—June, 13.75—July, 14.25—August, 14.875—September, 14.875—October, 14.625.

Brass Mill Zinc—Average for 1924, 7.10—January, 1925, 8.60—February, 8.00—March, 8.10—April, 7.60—May, 7.55—June, 7.55—July, 7.80—August, 8.10—September, 8.30—October, 8.90.

Daily Metal Prices for the Month of October, 1925

Record of Daily, Highest, Lowest and Average

	1	2	5	6	7	8	9	*12	13	14	15	16
Copper (f. o. b. Ref.) c/lb. Duty Free												
Lake (Delivered)	14.625	14.625	14.50	14.50	14.50	14.50	14.625	.....	14.75	14.75	14.75	14.75
Electrolytic	14.30	14.35	14.30	14.25	14.30	14.30	14.40	.....	14.50	14.50	14.40	14.40
Casting	13.75	13.85	13.75	13.75	13.75	13.75	13.875	.....	13.90	13.90	13.75	13.75
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb												
Prime Western	7.925	7.975	8.025	8.05	8.05	8.05	8.15	....	8.25	8.30	8.30	8.30
Brass Special	7.975	8.10	8.125	8.125	8.125	8.125	8.225	.....	8.35	8.40	8.40	8.40
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	60.375	60.25	60.00	60.50	60.875	60.875	61.75	.....	62.125	62.50	62.75	62.00
Pig 99%	58.75	58.625	58.375	58.75	59.125	59.00	59.50	.....	60.25	60.625	60.875	60.125
Lead (f. o. b. St. L.) c/lb. Duty 2⅛c/lb.	9.45	9.45	9.45	9.45	9.45	9.45	9.45	.....	9.45	9.425	9.425	9.425
Aluminum c/lb. Duty 5c/lb.	28	28	28	28	28	28	28	.....	28	28	28	28
Nickel c/lb. Duty 3c/lb.												
Ingot	34	34	34	34	34	34	34	.....	34	34	34	34
Shot	35	35	35	35	35	35	35	.....	35	35	35	35
Electrolytic	38	38	38	38	38	38	38	.....	38	38	38	38
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	17.25	17.25	17.25	17.25	17.25	17.25	17.25	.....	17.25	17.25	17.25	17.25
Silver c/oz. Troy Duty Free	71.125	70.875	70.875	70.875	71.125	70.875	71.00	....	71.50	71.25	71.125	71.125
Platinum $/oz. Troy Duty Free	118	118	118	118	118	118	118	.....	118	118	118	118

	19	20	21	22	23	26	27	28	29	30	High	Low	Aver.
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	14.75	14.625	14.625	14.625	14.75	14.75	14.75	14.75	14.75	14.75	14.75	14.50	14.667
Electrolytic	14.40	14.40	14.40	14.45	14.50	14.55	14.60	14.50	14.50	14.55	14.60	14.25	14.421
Casting	13.75	13.75	13.75	13.80	13.85	13.85	13.85	13.75	13.75	13.875	13.90	13.75	13.798
Zinc (f. o. b. St. L.) c/lb. Duty 1¾c/lb.													
Prime Western	8.35	8.35	8.45	8.60	8.65	8.65	8.65	8.625	8.65	8.70	8.70	7.925	8.336
Brass Special	8.425	8.45	8.65	8.75	8.75	8.75	8.80	8.80	8.80	8.85	8.85	7.975	8.446
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	62.50	62.50	62.625	63.625	64.125	63.00	63.50	63.125	63.875	64.00	64.125	60.00	62.232
Pig 99%	60.75	60.75	61.00	61.75	62.25	61.25	61.75	61.375	62.25	62.25	62.25	58.375	60.446
Lead (f. o. b. St. L.) c/lb. Duty 2⅛c/lb.	9.45	9.45	9.45	9.45	9.45	9.45	9.45	9.50	9.50	9.50	9.50	9.425	9.454
Aluminum c/lb. Duty 5c/lb.	28	28	28	28	28	29	29	29	29	29	29	28	28.238
Nickel c/lb. Duty 3c/lb.													
Ingot	34	34	34	34	34	34	34	34	34	34	34	34	34
Shot	35	35	35	35	35	35	35	35	35	35	35	35	35
Electrolytic	38	38	38	38	38	38	38	38	38	38	38	38	38
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	17.25	18.00	18.00	18.50	19.00	19.25	19.50	19.50	19.50	19.75	19.75	17.25	18.00
Silver c/oz. Troy Duty Free	71.25	71.125	71.25	71.50	71.50	71.375	71.125	71.375	71	70.75	71.50	70.75	71.143
Platinum $/oz. Troy Duty Free	118	118	118	118	118	118	118	118	118	118	118	118	118

*Holiday.

Metal Prices, November 9, 1925

Copper: Lake, 14.875. Electrolytic, 14.70. Casting, 14.10.
Zinc: Prime Western, 8.85. Brass Special, 9.10.
Tin: Straits, 62.125. Pig, 99%, 60.75.
Lead: 10.00. **Aluminum,** 29.00. **Antimony,** 20.00.

Nickel: Ingot, 34.00. Shot, 35.00. Electrolytic, 38.00. Pellets, cobalt free, 40.00.

Quicksilver, flash, 75 lbs., $89.00. Silver, oz., Troy, 69.50. **Platinum,** oz., Troy, $118.00. **Gold,** oz., Troy, $20.67.

Metal Prices, November 9, 1925

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	11 to12
Brass Ingots, Red	12 to13
Bronze Ingots	12 to13
Bismuth	\$2.65to\$2.70
Cadmium	60
Casting Aluminum Alloys	21 to24
Cobalt—97% pure	\$2.50to\$2.60
Manganese Bronze Castings	23 to41
Manganese Bronze Ingots	13 to17
Manganese Bronze Forging	34 to42
Manganese Copper, 30%	28 to45
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	19½to22½
Phosphor Copper, guaranteed 10%	18½to21½
Phosphor Tin, guaranteed 5%	65 to70
Phosphor Tin, no guarantee	65 to75
Silicon Copper, 10% ......according to quantity	28 to35

OLD METALS

Buying Prices		Selling Prices
12¼to12½	Heavy Cut Copper	13¼to13¾
12 to12¼	Copper Wire	13 to13½
10¼to10¾	Light Copper	11½to12
9¼to 9½	Heavy Machine Comp	10¾to11¼
8 to 8¼	Heavy Brass	9¼to 9½
7 to 7¼	Light Brass	8 to 8½
8 to 8½	No. 1 Yellow Brass Turnings	10 to10½
8¾to 9	No. 1 Comp. Turnings	10½to11
8½to 8¾	Heavy Lead	9¼to 9½
5 to 5¼	Zinc Scrap	6 to 6½
12 to13	Scrap Aluminum Turnings	15 to17
19 to20	Scrap Aluminum, cast alloyed	21 to22
23 to24	Scrap Aluminum, sheet (new)	25 to26½
38 to40	No. 1 Pewter	42 to44
12	Old Nickel anodes	14
18	Old Nickel	20

BRASS MATERIAL—MILL SHIPMENTS

In effect Oct. 26, 1925

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	\$0.19⅜	\$0.21⅛	\$0.23⅛
Wire	.19⅞	.21⅝	.23⅝
Rod	.17⅛	.21⅞	.23⅞
Brazed tubing	.27⅜	......	.32⅞
Open seam tubing	.27⅜	......	.32⅞
Angles and channels	.30⅜	......	.35⅞

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	\$0.20⅜	\$0.22⅛	\$0.24⅛
Wire	.20⅞	.22⅝	.24⅝
Rod	.18⅛	.22⅞	.24⅞
Brazed tubing	.28⅜	......	.33⅞
Open seam tubing	.28⅜	......	.33⅞
Angles and channels	.31⅜	......	.36⅞

SEAMLESS TUBING

Brass, 24c. to 25c. net base.
Copper, 25c. to 26c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	21⅜c. net base
Muntz or Yellow Metal Sheathing (14"x48")	19⅜c. net base
Muntz or Yellow Rectangular sheet other Sheathing	20⅜c. net base
Muntz or Yellow Metal Rod	17⅜c. net base

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	22c. to 23c. net base
From stock	23c. to 24c. net base

BARE COPPER WIRE—CARLOAD LOTS

17c to 17¼c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	21½c. net base
100 lbs. to 200 lbs. in one order	22c. net base

ZINC SHEET

Duty, sheet, 15%	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	11.75 basis
Casks, jobbers' price	13.00 net base
Open Casks, jobbers' price	13.50 to 13.75 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	40c.
Aluminum coils, 24 ga., base price	36.70c.
Foreign	40c.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	27c.
15% "	28½c.
18% "	29½c.

Nickel Silver Wire and Rod

10% "	30c.
15% "	33½c.
18% "	36½c.

MONEL METAL

Shot	30
Blocks	30
Hot Rolled Rods (base)	35
Cold Drawn Rods (base)	42
Hot Rolled Sheets (base)	42
Cold Rolled Sheets (base)	50

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 25 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs. 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 73¼ to 75¼c. per Troy ounce, depending upon quantity.

Rolled sterling silver 70½ to 72½c.

NICKEL ANODES

95 to 92% purity	45c. per lb.
95 to 97% purity	48c. per lb.
99% plus	50c. per lb.

Supply Prices, November 9, 1925

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.12-.16
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., Carboys	lb.	.06
Nitric, 42 deg., Carboys	lb.	.07
Sulphuric, 66 deg., Carboys	lb.	.02
Alcohol—		
Butyl	lb.	22.7-27.2
Denatured in bbls	gal.	.60-.62
Alum—		
Lump Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—		
Sulphate, tech, bbls	lb.	.03¾
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, kegs	lb.	.08
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), bbls	lb.	.05½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls	lb.	.33
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, bbls	lb.	.17
Cyanide	lb.	.50
Sulphate, bbls	lb.	.05
Copperas (Iron Sulphate, bbl.)	lb.	.01½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron, Sulphate, see Copperas, bbl	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.15
Nickel—		
Carbonate dry, bbls	lb.	.29
Chloride, bbls.	lb.	.21
Salts, single bbls	lb.	.10½
Salts, double bbl.	lb.	.10
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity		.35-.40
Potash, Caustic Electrolytic 88-92% fused, drums	lb.	.093
Potassium Bichromate, casks (crystals)	lb.	.08¾
Carbonate, 82-92%, casks	lb.	.06¼
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide (Fluctuating Price)	oz.	.70
Nitrate, 100 ounce lots	oz.	.49½
Soda Ash, 58%, bbls	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.05½
Cyanide, 96 to 98%, 100 lbs	lb.	.20
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls	lb.	.04¾
Phosphate, tech., bbls	lb.	.03¾
Silicate (Water Glass), bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.13
Sulphur (Brimstone), bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.43½
Tripoli, Powdered	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls	lb.	.02
Wax—		
Bees, white ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls	lb.	.11
Chloride, casks	lb.	.07⅝
Cyanide	lb.	.41
Sulphate, bbls.	lb.	.03⅛

COTTON BUFFS

Open buffs, per 100 sections (nominal),

12 inch, 20 ply, 64/68,	unbleached sheeting	base,	$32.40-	$40.85
14 inch, 20 ply, 80/96,	" "	base,	45.25-	50.80
12 inch, 20 ply, 80/96,	" "	base,	47.35-	46.20
14 inch, 20 ply, 84/92,	" "	base,	63.15-	62.25
12 inch, 20 ply, 88/96,	" "	base.	....	63.25
14 inch, 20 ply, 88/96,	" "	base,	....	85.15
12 inch, 20 ply, 80/96,	" "	base,	....	52.70
14 inch, 20 ply, 80/96,	" "	base,	....	70.80

Sewed Buffs, per lb., bleached or unbleached . base, .55 to .75